

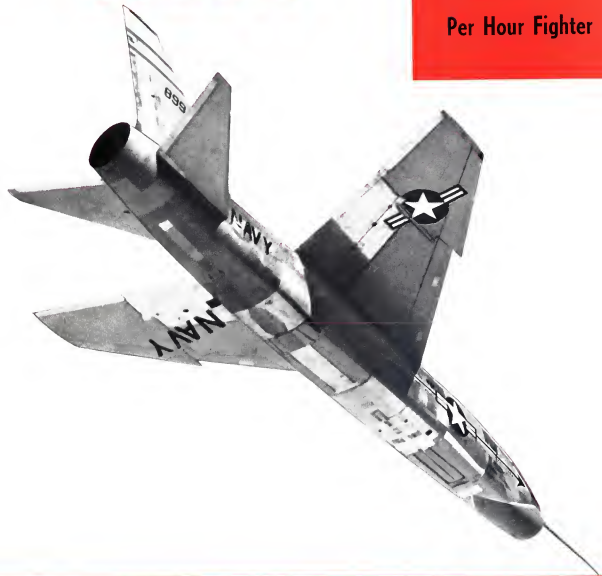
JANUARY 23, 1956

50 Cents

AVIATION WEEK

A MCGRAW-HILL
PUBLICATION

**Navy's Crusader:
Thousand-Mile
Per Hour Fighter**



Defense Budget Stresses A

**8 reasons why engineers
choose constant frequency A-C
power for new jets...**



Recently, a staff of engineers was asked to analyze all types of electrical systems available and to prepare recommendations on the best system for a series of new jet tankers and transports. Of all constant frequency systems, of all other types of systems, the Sundstrand-driven constant frequency *a-c* system stood highest for three right angle reasons:

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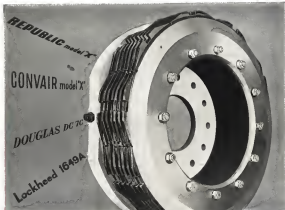
- ⑦ **Power Types of Power** are required, resulting in less confusion, simplified training, smaller stocks of equipment.
- ⑧ **No Beat Frequency** between inverter and alternator to cause a satisfactory operation of certain equipment. The Sundstrand driven system is the only one in which alternators can be paralleled.

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The simplicity of design of the Goodyear Tri-Metallic Brake

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Actionflex in Action

Fiberglass-Silicone

Memo

To: Chief Engineer, Plant No. 4
From: Field Engineering Office
Subject: Actionflex Field Report #55-157

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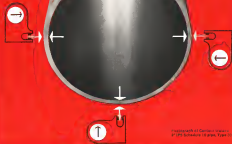
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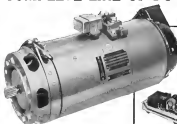
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3000-3	45	2200-1500	28,000	15	11.8
3000-4	75	2200-1500	28,000	24.5	11.8
3000-5	100	2200-1500	28,000	48	11.8
3000-6	150	2200-1500	28,000	72	11.8
3000-7	200	2200-1500	28,000	96	11.8
3000-8	250	2200-1500	28,000	120	11.8
3000-9	300	2200-1500	28,000	144	11.8
3000-10	350	2200-1500	28,000	168	11.8
3000-11	400	2200-1500	28,000	192	11.8
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VISIBILITY by Swedlow

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JANUARY 25, 1956

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AVIATION WEEK

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Budget Sets \$6 Billion for Aircraft, Missile

► Fiscal 1957 budget calls for substantial missile increase, reflects changing character of air weapons.

Red Gains Threaten 'Deterrent Force'

► Gen. Fawcett, ARDC chief, warns of 'very real danger' that Red advances could put U. S. 'at their mercy.'

Avionics Warned on Transponder Problems

► Indications are that avionics will go ahead with plans to improve ground radar performance, identification.

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The New Avionics Product

COVER: Chance Vought's F1U-1 Crusader has been at 10,000 mph. Application of Richard Whitcomb's new rule (AW Sept. 12, p. 12) in three dimensions on the Crusader then on the post-war Cessna F-102A and Grumman F1U-1. Additional details on the Navy carrier fighter on p. 29.

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Member AEP and ABC

AVIATION WEEK, January 25, 1956

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The New Airpower Fraud

The Fiscal 1957 airpower budget presented to Congress last week is deceptive. Although the Defense Department budget shows increases both in new obligational authority (\$2.5 billion) and in expenditures (\$1 billion) for Fiscal 1957, it falls miserably short in meeting the real needs of military airpower in the critical areas of research, development, production and maintenance. Evaluated on the scale of current international problems, the Fiscal 1957 budget imposes artificial limitations on the growth of airpower that are as bad as those in the now infamous Fiscal 1950 budget of Louis Johnson, Defense Secretary of the Truman Administration. It is important to remember that Johnson's airpower budget that was once hailed as adequate for our defense needs and as "putting the lid but not out the window," strongly encouraged the Communists to launch their Korean aggression and sent us into that bloody fray woefully weak in the air.

If the Fiscal 1957 airpower budget is approved by Congress without change, it will send notice to the Communists that our military airpower is again on the decline and that our policy of massive retaliation is being built on blind and blatant rather than informed concepts. This airpower budget submitted by the executive branch of the Government will mean that American airpower will lose further ground as its technology will not keep the fast growing Communist air forces. If the trends it indicates are continued, American airpower will not only fail to improve its present state margin of superiority over the Communist air fleets but will not even maintain its present position.

For this Fiscal 1957 defense budget is not a budget of airpower progress, as billed by Defense Secretary Wilson, but a budget of airpower stagnation followed by inevitable retrogression.

There are three principal areas in which this airpower deception is being perpetrated:

• **First**—Stretched current aircraft production is being continued by a limitation on expenditures. This means that the modernization rate of our combat units is being artificially retarded and that the aerial weapons in our usable arsenal will be deliberately kept close to the beginning of their obsolescence curve.

• **Second**—The fallacy of the constant level of funds for research and development that is adopted again in this budget (AW Jan. 2, p. 13) will mean that our technical pace will not be appreciably accelerated and will certainly lose more ground in this race with the Russians.

• **Third**—Pursue the procurement of new aircraft have been cut substantially for the Air Force so that only 1,000 new planes can be constructed for during the next year. This is a bare low level of new planes that loses last year's year through normal operational attrition. It is about 1,400 planes short of what USAF estimates it needs annually merely to maintain and modernize its authorized 137 combat wing strength.

Consequently imposed by top level Defense Department officials in the past of military security has seriously weakened the real problems facing the Air Force in particular and our military airpower in general.

For example:

• **Nearly one-third of the fighter strength of Tactical Air Command is provided due to lack of qualified maintenance personnel.** Strategic Air Command has quantities of bombers provided for the same reason, although it has not been so hard in TAC.

• **Strategic Air Command is rapidly losing its international status attack capability as the B-36, only bomber in the U. S. arsenal with genuine intercontinental range, is sliding rapidly down the obsolescence curve.** SAC is now essentially a continental force relying almost entirely on B-47s that require multiple aerial refueling from relatively slow KC-97 tankers at low altitude to operate against the Russian homeland even from foreign bases. General LeMay's program to re-equip SAC is just as possible with longer range B-52s and the KC-135 jet tanker comparison have been jettisoned by the Fiscal 1957 airpower budget. For the next several years, the retaliatory power of SAC will be significantly curtailed by this production stretchout, and its future power will be delayed by the research fund ceiling.

• **USAF's expansion program to 157 combat wings by the end of Fiscal 1957 is programmed on such a financial basis that it will actually reduce the full strength of combat-ready wings now scheduled for that date.** USAF is rapidly resorting to its 1950 definition of organizing "paper" understrength wings to provide an illusion of meeting its program when in fact its real combat strength is not increasing.

In procuring this airpower budget to Congress, Defense Secretary Wilson testified that:

"Nothing has occurred in the international situation during the past year which would indicate the necessity for any major change in these policies and concepts."

Yet, during the past year, all of the responsible leaders of the Air Force including its Chief of Staff, General Nathan Twining, his vice chief, General Thomas White, USAF Secretary Donald Quarles, the Assistant Secretary for Research and Development, Trevor Gardner and Lt. Gen. Thomas Power, commander of the Air Research and Development Command (see page 13), have all publicly warned that the now-known lackluster program made by Russian airpower poses one of the gravest challenges ever faced by this nation.

In the face of this glaring contrast between the urgent warnings of the top military airpower leaders and the blood conspiracy expressed by Defense Secretary Wilson and his Fiscal 1957 Defense Department program, Congress should make the most strenuous efforts to determine our genuine airpower problems and eliminate them in a drastic effort before reaching a verdict on this vital budget.

We can expect a barrage of official propaganda to support the Fiscal 1957 defense budget combined with nebulous attempts to suppress its critics among important military leaders.

But we are reaching a critical point in the technological race with the Russians for superior weapons. The stakes in the race far surpass a political victory or a military propaganda. This is a time for our congressmen to speak out before the airpower budget fraud becomes a fact.

—Robert Rabe



Photos, top to bottom: Boeing B-52D Stratofortress, B-47 Stratojet, and "607" jet transport. All of these sleek, sleek-wing jets utilize Macwhyte "Hi-Fatigue" control cable.

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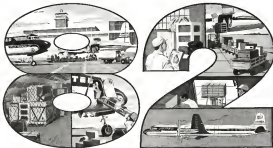
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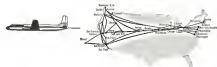
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Washington Roundup

Profit Investigation

The prospect is that the opening of public hearings on military aircraft profits before the House Armed Services Subcommittee will be delayed until next week.

Aircraft manufacturers are expected to be called first, then engine companies, and then major subcontractors. An executive officer of the subcommittee, headed by Rep. Edward L. Brooke (D-Mass.), will decide companies to be called and the procedure to be followed at the hearings. Rep. Carl Albert (D-Calif.), chairman of the Armed Services Committee, and Rep. Donder Shriver (R-Mo.), ranking Republican, are also active members. The hearings are expected to last at least a month.

Semmes to CAB?

Gen. Harry H. Semmes (R. S. A. Ret.), a Maryland Republican, appeared last week to the White House clerk to request Ben Bailey as chairman of the Civil Aeronautics Board. A patent attorney in Washington, Semmes was a defendant candidate for the Board post until the Republican National Committee was asked to allow him and a security clearance was granted. Both Republicans Maryland senators, James East and John Stennis, were advised that Semmes was under consideration for a CAB appointment, as was Rep. DeWitt Hyde (R-Md.). It is expected that the nomination will go to Congress simultaneously with the appointment of Bailey as a judge.

Visits to Russia

There is growing hope that administration reconnaissance about Russian technological capabilities will be pressed as a result of the recent use of good friendship and exchange of visitors with that country. Top Air Force officials and security experts such as Lt. Gen. Thomas S. Power (age 31) have been frustrated in their efforts to make the point that the Russians have this capability and it is growing fast despite the fact that most Russians don't drive a Chevrolet sedan.

Recent visitors from a tour of Gorky, Stalingrad and Leningrad are three members of the American Society of Mechanical Engineers: Neville L. Hunt of Ford Motor Co., Dr. William H. Bush of Westinghouse and Dr. Albert C. Hall, research vice president at Hughes Aircraft. They have reported their observations to the State Department, and these include:

- Russia's technological are highly qualified and for high-precision projects are granted anything they need in staff and facilities, allowing fast development.
- A digital computer, comparable in some complex American types, was recovered and built in 21 days. The Americans, familiar with that equipment, were highly impressed by the accomplishment.
- Semi-automatic lathe are being built in Russia as an emerging standard lathe at a rate of 50 a day. American output is 1,000 a year.
- Russian workers, both technological and in industrial plants, display a high level of skill and enthusiasm. They have a good incentive system, 25 to 40% bonus for production records, and "Stakhanov competition" between workers, with cash rewards for performance.
- In addition to computers and machine tool design, most important performance was in a lathe boring plant

that is as good as any in U. S. Management and technical direction is excellent.

- Of 1,700,000 Russian students, over 500,000 are following technical and scientific courses.
- In the technology area, the United States "cannot afford to be complacent."

'Constructive' Information

Defense Department's policy of releasing only information it judges "constructive" is making recruiting congressional opponents. At a congressional hearing, it was staunchly defended by K. Paul Hoffman, former Deputy Assistant Secretary of Defense for Public Affairs. Rep. John Moss (D-Calif.) challenged the position that it is not "constructive" to release information as the differing views of the services.

Hoffman explained: "The main thing to be done with differing opinions is to give them their day in the sun. The Department is developing policies. Policies are to be beaten out of a lot of different points of view. But after they have been beaten out and become the policy, there can be very little purpose served in seeing those things to the public."

He added: "There have been occasions where information that was prepared within the departments, because of the rivalry and the competition between the various branches of the services, those a sometimes reflected discredit upon a sister service... and such statements... could mislead and possibly cause the public if they accepted the discreditable for one of the services."

Rep. Clarence Hoffman (R-Mich.) was skeptical that Defense Department would consider information concerning the "state of weapons security" as "constructive." Hoffman said that it "might" be considered constructive to have such information known "because it would put it back on our toes."

Insisting that there is a free flow of information from Defense Department, Hoffman explained: "I have not expressed any opinion as to what information was required and not required, except when such administration in the opinion of responsible persons was considered of a nature which would jeopardize the security of our country or would violate sources of information of higher authority."

Meanwhile, Philip S. Allen has been named acting Deputy Assistant Secretary for Public Affairs in the Defense Department, filling the position vacated by J. H. Hoffman. Allen was moved from a post as executive assistant to Robert T. Ross, the Assistant Secretary for Legislative and Public Affairs.

Allen has been in the office since last April. Like the Assistant Secretary, he is a Republican and served for two years as Chief Clerk of the Senate Armed Services Committee.

Independent CAA

House Committee Committee is not inclined now to act on legislation providing an independent Civil Aeronautics Administration. Rep. Otto Klum (D-Mich.), chairman of the Subcommittee on Aviation, states that his group will probably vote next week and if the Senate passes the measure, introduced by Sen. Mike Mansfield (D-Mont.). A companion to the Mansfield bill, though, was introduced on the House side by Rep. Percy Foreman (D-Texas), chairman of the committee.

—Washington staff

Aircraft and Related Procurement Funds

	New Money			Expenditures		
	FY 1958	FY 1959	FY 1957 Request	FY 1958	FY 1959	FY 1957
Air Force	5,366	6,382	5,820	6,959	5,888	6,187
Navy	1,313	902	1,318	1,425	1,375	1,900

the capabilities of our technology."

- Major projects in the S-40 include request for air navigation facilities and
- Increased radar for traffic control
- Expanded communications capacity in control towers and clinics
- Additional VHF radio ranges to provide multiple coverage
- Procurement of five transport class aircraft (C-119) for the Department of Defense
- Flight inspection of navigation facilities

The increased budget is part of CAA's newly developed authorization program for the period 1957 through 1961 (AW No. 34, p. 141). The five-year program, approved by the Air Coordinating Committee, is designed to provide facilities needed to meet current and future demands on the national system.

CAA's share of air navigation development, which is administered by the

Air Navigation Development Board, has been set at \$2 million, or double the current appropriation.

ANDB's report explains in 1957 is to be placed upon air traffic control aids, with \$1,296,000 allocated to this activity. Other research and development activities on sensory facilities—vision, ranging and air navigation—will be included.

The operation of CAA has been budgeted for \$125,980,000, which is an increase of \$23,730,000, which is to provide for an additional 1,600 positions.

Large programs in the operating category in the Federal account. The budget for this function has been increased to \$311,099,000. The additional funds are required for three items:

- Greater workload resulting from increased traffic
- Operation of new facilities.

• Operation of traffic control facilities formerly financed by USAF and Navy. Operation of the Office of Aviation Safety is projected at \$13,688,000 and administration of airport and air mail at \$3,711,000.

An appropriation of \$30 million is requested for the airport and program, which is an estimate of what will be needed to liquidate obligations incurred.

In fiscal 1959 total funds authorized totaled \$67.5 million. It is estimated that expenditures for airports will rise to \$75 million in 1957 and expenditures will be \$78 million.

CAB Budget

Budget requests for the Civil Aeronautics Board show a doubling of funds in subsidy needs and a slight increase in administrative funds.

In his message to Congress, President Eisenhower attributes the subsidy cuts to the reduction in the cost of air travel. CAB's budget is keeping subsidy rates at the lowest possible level.

Subsidy payments to the carriers will amount to about \$14.4 million in fiscal 1957. The \$28 million appropriation will be increased by \$14 million to \$42 million in fiscal 1959.

The board's budget for 1957 is \$4.7 million. The board's budget for 1959 is \$5.7 million. The board's budget for 1961 is \$6.7 million.

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NACA Budget

The National Advisory Committee for Aeronautics is asking \$84.7 million for research and operations in its fiscal 1957 budget, an increase of about \$4.5 million over fiscal 1956, and \$15 million for construction, an increase of about \$2.5 million over fiscal 1956.

NACA's construction request provides for new facilities at Langley and Ames Laboratories for research in the problems of flight at hypersonic speeds, and the coordination of two existing wind tunnels at these laboratories. Additional will be made to the propulsion system laboratories at Lewis Laboratories to permit research under higher altitude conditions and utility improvements for hypersonic reentry vehicles.

Ames will be allocated a \$6.8 million at Langley, \$95,000 at Ames and \$7.8 million at Lewis.



Vought's Crusader Design Meets Navy's High Performance Criteria

By David A. Anderson

Even aerodynamic features carefully selected for optimum performance.

The Crusader's wing is of low aspect ratio, very low thickness ratio—approximately 5%—and about 40-deg. sweep. It is high-mounted on the fuselage and has a small amount of negative dihedral for improved lateral stability.

Disturbed flow of the wing, which likely appears for certain stages, has a leading-edge extension. Purpose of this

extension is to generate a vortex, at high angles of attack, the inboard edge of the extension sheds a vortex which sweeps the wing leading edge clear of boundary layer stall delays to stall.

Admission is needed inboard of the nose pylon, to induce, maintain deflection and the possibility of asymmetric effects as the flow wing. The vortex leading edge of the wing seems to act as a drooping wing.

Twelve of the Crusader was laid out by the air rule procedure to obtain an optimum lift-to-drag ratio and an optimum cruise ratio and an optimum climb rate. Centering of the plane is not as apparent as it is on the Crusader (F-105) or the Crusader (F-111F). This is because of the aircraft's rectangular cross section and the particular conditions for which the air rule was applied.

An underlying goal for the 157 is to bring under the Crusader's nose. During run off under the pilot's floor to the engine, mounted above the landing gear well.

With an area in the wings to increase lift, all change in the 2000 is in the fuselage alone at the engine.

Obligation Status

As fiscal schedules allow for the first of fiscal 1958 and related procurement contracts at a fiscal rate of \$1 billion monthly during the first five months of fiscal 1958—over December through June.

The annual budget for the USAF obligation for aircraft procurement of \$1.9 billion during fiscal 1958. During the first five months, obligations are about \$1 billion monthly. This makes a total of \$5.1 billion for the first five months.

USAF had \$108 billion in obligation against procurement funds on hand in Dec. 1.

Navy's obligation for aircraft and related procurement totaled \$444 million during the first five months of fiscal 1958, an average rate of \$88 million monthly. To meet its program calling for obligation of a total of \$2.3 billion during fiscal 1958, Navy must be at least \$1.9 billion in obligation by the end of the December through June period as at an average monthly rate of \$146 million. About three times the rate during the first five months.

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Civil Aeronautics Administration

(In Millions)

	FY 1958 (Actual)	FY 1958 (Estimate)	FY 1957 (Estimate)
Administration Operations	90	90	91
Airports	13	14	14
Alaska	2	3	4
Establishment of Air Navigation Facilities and Control Limitations	25	27	30
Quadrant-Aid for Alaska and Control Limitations	25	27	30
Washington National Airport and Alaska Airports	2	6	2
Air Navigation Development	1	1	2
TOTALS	131	164	193

Civil Aeronautics Board

Appropriation Request	48.9	55.3	50
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National Advisory Committee For Aeronautics

(In Millions)

	FY 1957 (Actual)	FY 1958 (Estimate)	FY 1957 (Estimate)
Administration	51.5	50.8	45.7
Construction	6.8	4.4	6.5
Research	9	6.3	7.8
Research	3	1	1.2

Final Tests for SAGE

Langston, Mass.-offered evidence tests on a "little SAGE system," prototype of a proposed nation-wide network of 11 automatic data processing centers designed to protect against U.S. air deliveries, should be completed here this summer.

This was followed by the Air Force partially, about the wings of the SAGE (Semi-Automatic Ground Environment) system and the Massachusetts Institute of Technology's Lincoln Laboratories, which headed the development of the multi-bank digital air defense network under joint Army-Navy-USAF sponsorship. The scope of the tests and the number of large industrial firms participating, give the SAGE program a new lease in the World War II Manhattan project which developed the atomic bomb.

First production prototype of the large digital computer, which forms the heart of the SAGE system, is presently undergoing shakedown tests here as part of "little SAGE," called the Cape Cod System, consisting of a language code and another possible codes, each of which automatically transmits data to the computer.

A detailed report on the SAGE system and how it operates will appear in next week's issue of Aviation Week.

Boeing Appeals Renegotiation Ruling, Criticizes Board Action

Seattle-based Boeing Co. will respond to the U. S. Tax Court's ruling that Boeing's determination that \$6,822,540 must be returned on excessive profits from 1952 earnings.

Boeing contends that the net refund after taxes should be \$2,910,000, and that a percentage of the Boeing's findings would result in total refunds of about \$7 million for 1953 and 1954 combined and no refund for 1955.

C. O. Young, Boeing vice president-finance, and the Boeing's determination is not consistent with the Renegotiation Act and is not supported by the facts and reasons the Board furnished the company.

Not Worth Emphasis

Young was critical of the Board's emphasis on net worth.

"In the opinion of Boeing management," he said, "the return on net worth" criterion for evaluating excessive profits of earnings was the controlling factor in the Renegotiation Board's determination. This criterion, at least in the renegotiation process, is contrary to a statutory obligation of the return (earnings) realized on book net worth and does not measure the reasonableness of the price of articles furnished the Government. Further, it is in no way, given consideration to the efficiency of contractors as their contribution to the defense of the nation."

Boeing's 1953 earnings, Young said, represented only a return of 2.35% on sales after income tax and was reduced to 1.89%. An act return of 1 to 6% on sales was earned by the manufacturing industry generally. He said the earnings below negotiation were well within the profit framework established

at the time the contracts were negotiated with Government procurement agencies.

Young stated that the Board's determination, if retained and indicative of the future determination pattern, was seriously affect Boeing's ability to go forward with planned further expansion and research and development programs.

Air Force has strongly urged the aircraft industry to finance a substantially greater portion of its facility and research needs.

The Boeing official and the 1952 earnings were reasonable under all renegotiation concepts. A taxable portion of Boeing's earnings was that to fund gross research with excessive profits.

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Damage to Incentive

If the Board's action is allowed to stand, it will depress the concept of the return against which was specifically moved in 1953 as a reward for efficient cost performance an incentive contracts. Also, it will go far in removing the element of incentive which is so important to the American way of doing business.

It does not appear desirable, in the light of the overall objective of obtaining more defense per dollar, to destroy incentives that inevitably lead to lower prices to the Government," he said.

Nuclear Power, ICBMs Top Industry Problem

Washington—Most serious technological problems are those associated with nuclear power for aircraft and the intercontinental ballistic missile, National Advisory Committee for Aeronautics and in its 1955 annual report.

"Indeed, our industrial economy may well depend on the intensity and competence of our research to solve such problems," said Dr. Jerome G. Thompson, NACA chairman.

There is evidence to indicate that our present position of leadership in the air has been challenged by a potential enemy. In addition, at manageable cost, the enormous air power of rapidly growing countries continues research to anticipate the requirements of tomorrow's weapons," he said.

Highlighting progress made during the past year, the annual report singled out the area of rocket engines of Richard T. Wright, one of the NACA's Langley (Va.) Laboratories staff.

Research programs of the past year were largely concentrated on solving a practical problem in the scientific problem of propulsion flight. "Application of the new knowledge has been demonstrated in some important instances," Thompson said, "but the industry is still of vast extent."

In aeronautics research, stability and control have continued to take a large share of the research activities. Increased use of ground and flight simulation and electronic computers has supplemented wind tunnel and flight test studies of the stability problems.

On the other side, new and improved theoretical and analytical techniques have added the critical elements of aerodynamic information.

In propulsion, NACA is studying features of certain engines using chemical and nuclear fuels. Wind tunnel experiments in a number of recent studies aimed at improving the performance of gas-turbine engines. The special problem is one of finding solutions to the problems of high efficiency, high temperatures and high efficiency.

In structures, NACA is working in the major area of structural safety. Research in airplane performance has been aimed at the improvement of observing the right material to withstand loads and the responsiveness of high speed flight.

With such advance in speed, problems requiring scientific, technological and engineering research are difficult, and their study and solution must cost. The potential advances to the cause of world peace if America first solves these problems are obvious," the report said.

Red Gains Threaten 'Deterrent Force'

Gen. Power, ARDC chief, warns of 'very real danger' that Red advances could put U.S. 'at their mercy.'

New York—The "red and white, dark" threat that Soviet technological advances will leave the United States at Russia's mercy, warning out the advantages of our current deterrent force, is today's major concern of the U. S. Air Force.

Lt Gen Thomas S. Power, chief of the Air Research and Development Command, in one of the strongest statements on the subject delivered by a USAF officer since Russia demonstrated its announced advances in 1955, and last week at a National Research Industrial Assn. meeting.

The problem is no longer phantasm to us for the Soviets have brought it to the attention of the world through their air shows and by the recent explosion of a nuclear rocket engine.

They have chosen to cover the race for technological supremacy, of the world's state into which we have been forced by necessity.

Gen. Power said it is typical of the American way that we are developing weapons not to deter a potential aggressor "in this show of force" but to guarantee that the enemy cannot do us "in an attack case."

'At Her Mercy'

He said emphatically, that the United States has used qualitative superiority to maintain security in deterrence force. "We are confident we can keep this superiority in new fields."

"But," he declared, "there is even indication that the Soviet—their new effort to our security—may make even effort to maintain parity with us, but to be sure in. With both quantitative and qualitative superiority on their side, we would lose the protection of the deterrent force and be at their mercy."

"The danger is very real and so immediate as the following considerations will show. First of all, the Soviets have several advantages in their current effort to establish technological superiority over this country. In comparison with the United States, they can afford a far greater portion of their national income for military spending. In a word, if national security, our military budget could well be larger than that of Russia but the real difference is that our probably less costly means for air power, maintenance, the then does their. Therefore, they can afford vast resources to technological developments without prior approval of the public. This can control ideas and devices in industry in a manner which

the free world finds impossible and so desirable."

"Through application of their methods, the Soviets have achieved some rather remarkable results since World War II. They have not only managed to maintain their air force and their military production for military purposes, but they have even increased the rate of their military spending. While the Soviets recently announced an automobile 5 to 10% decrease in their 1956 military budget, yet experts believe that does not include "hidden figures."

In the period of 1945 to 1947 they have made significant technical progress, particularly in the development of jet engines and fighter bombers. They have developed the MiG-15, the MiG-17, the MiG-19, the MiG-21, the MiG-23, and the MiG-25, all of which are highly advanced jet-powered aircraft available to the Soviet Union. Gen. Power said that the Soviet Union has a large number of jet fighters, including such models as Mikoyan, Gorbunov and Dornier.

"In addition, the Soviets captured thousands of skilled technicians from Luftwaffe ground units and put to effective use these knowledge, together with materials furnished by some of the leading aeronautical engineers of Germany, to develop a new type of jet engine to work in Soviet aircraft for 1955. Nor should it be overlooked that the Soviet's a great deal of valuable equipment from us during the 1941-45 war period."

Gain Recorded

Later in 1947, the Soviets put into their squadrons the first jet planes, the Yak-11. They also captured the YAG-9 with a German JUMO jet engine of 2,800 hp thrust.

In the summer of 1947, the Soviets were launching their squadrons with the first jet fighter designed and produced by native talent—the MiG-9—which was equipped with two German BMW jet engines and intended for use in ground attack missions.

In the period of 1948 to 1950, the Soviets made great strides in the development and production of jet engines, and began to close the technological gap that had existed between the two nations. They also, in particular, have these developments. One exploitation of the British Nene jet engine, a number of which had been sold to the Soviets; two, advances



LT GEN THOMAS S. POWER

in the field of metallurgy, possibly used by members of the former blocks under the Nazis, their development and production at the MG-15.

In 1951, the Soviets brought out a new interceptor, the MiG-17, and continued their high level of activity in the improvement of their bomber capabilities. Today, they are fastly replacing a formidable threat against our country as the following review of their record will show.

Longest Fighter Force

They have built up their fighter force, from a few thousand conventional fighters in the early 1940s, to the largest fighter defense force as the world, completely self-sufficient.

"They have built up a growing fleet of modern conventional fighters, 25,000, equipped with high speed, high altitude, high altitude jet engines, and have modern and heavy jet bombers which can be compared with the most advanced aircraft we possess."

"They have made progress in the field of electronics and appear to be closing the gap between Soviet and Western technology in this field."

"They have produced their atomic weapons, and have a device equipped with a three-megaton system, the former is a much more than that we expected, the latter only four years later—no longer than that that between the first atomic and thermonuclear explosions in the U. S."

"They appear to be making progress in the development of long range missiles to replace their long range bomber force."

"They have not the facilities required for automated development by replacing their long range missiles of operations."

greater inducements to enter the scientific field, thereby providing us with larger numbers of young scientists. To maintain our lead in this field will cost money. But if we do not live up to the reality that Russia is not closing the gap, we may soon be outdistanced by them in the race for technological supremacy.

The final question, then, is if the Soviets may characterize us as a country, why should they not, some day, challenge our "creative superiority" in spite of everything we may do to prevent it? I am confident that they never will, because the art of creation presupposes a state of mind, an atmosphere of work, an attitude toward fellow men, which are as foreign to Soviet philosophy as their is to ours.

"True creation is a reflection of the reality of the people, of the very way of life as it can exist only as a free society. It is for this reason that the free industrial nations of the world have by far higher standards of living than the Soviets and their satellites."

"Thus, the outlook is grim but not hopeless. As long as we recognize and face the facts, and act accordingly, as long as we work together as a team in maintaining technological superiority, and as long as we can and are willing to pay the price for "security by deterrent force," we have nothing to fear. For this day is bound to come when even the most stubborn aggressor must recognize the truthfulness and hopefulness of the men for nations represent real, credible to the demands of his harassed and disillusioned people, will create defeat.

"It is this, and only this, that we no longer need 'Security by deterrent force.' Because there will be no further war and no further security as we stand the security created by the actual trust and friendship among all the nations of this world."

Teneco Develops Primary Thruster for Export Market

Dallas-Teneco Aircraft Corp. has developed a single engine light aircraft primary thrust engine for the foreign market. The company designation is Model 55.

The new plane is a two-place, low wing, all-metal airplane powered by a 50-hp, four-cylinder, 400-AIA engine. It has a tricycle landing gear and power-driven bubble canopy.

Without armament the 55's gross weight is 2,995 lb., service ceiling is about 75,000 ft., cruising speed 174 knots, range 485 statute miles.

The tractor can carry a variety of armament. There is provision for installation of two 50 or 30 caliber machine guns, two machine guns, two 108 lb. bombs and 16 rockets.

Defense Rejects Hoover Proposal To Merge Assistant Secretaries

Washington—Department of Defense has rejected the recommendation of a Hoover Commission task force that it combine the offices of the Assistant Secretaries for Research and Development and Applications Engineering.

In comments on the Hoover Commission report on research and development (AW June 4, 1975, p. 11) the Defense Department also declines there also means to utilize the present \$10 million level of annual spending for basic research.

The Commission's task force had considered the \$10 million into two separate offices because "the tempo of progress in proprietary technology is limited by availability of new basic and applied scientific knowledge."

The Defense Department replied that it actually spends more than \$10 million a year on basic research because a substantial amount of this work is supported through applied research and weapon system contracts.

Too Early

It added that the Department "plans a moderate increase in the level of support of such basic work in its Fiscal 1976 program. Moreover, this field will be continually screened in order to obtain the maximum contribution to our long-range applied research and development programs."

On the task force's recommendation that the offices of two assistant secretaries be combined, the Department stated in effect that it is too early to decide on the task force did not the present setup is unsound.

It pointed out in its comments that Joint Coordinating Committees have been created to combine operations of the Research and Development and Applications Engineering offices.

Since the task force's study, the Department explained "The Secretary of Defense has strengthened the Applications Engineering organization by appointing to the Assistant Secretary (Applications Engineering) responsibility for recommending action on appropriate and representative requests to obligate production and procurement funds, making requests for product improvement projects."

The Department says no further changes should be made until these developments have been made and that, "in any event, the two separate offices should be preserved."

Present Assistant Secretary for Applications Engineering is Frank D. Newburg. His counterpart for Research and Development is Dr. Clifford C. Puzan,

who replaced Donald Quarles when the latter became the Secretary of the Air Force.

Research Comments

In all, the Hoover Commission task force made 15 recommendations, most of which the Defense Department did not find objectionable. However, in its comments, these objections were made on the research and development side:

- The Secretary of Defense is using his authority over funds to make sure that research programs are properly integrated and to prevent duplication of effort.

- The Assistant Secretary for Research and Development will appoint a standing committee to "evaluate the needs and opportunities presented by new scientific knowledge for inclusion into weapons systems."

- Action is being taken to shift the weapons system evaluation program to a contract operation in order to get a more adequate staff. However, the department will maintain a small weapons system evaluation group to take care of responsibilities that cannot be contracted.

- The Army is seeking a new Assistant Secretary for Research and Development. (William H. Martin now is serving as Army's Director of Research and Development.) The duties of the Assistant Secretary of the Navy for Air (James H. Smith, Jr.) have been lightened to give him time for greater concentration on research and development.

- The Department does not believe "all" research and development and design can be best performed by civilians, except when that work will be best performed by government scientists and technologists. The program will be expanded and research shifted to industry if they can be performed there more effectively.

- Policies will be reviewed where they have a bearing on the conduct of military efforts in research and development (improved stabilization of some personnel to desirable but officers still must not be so isolated that they get out of touch with operational problems).

- Higher salaries for civilian scientists and engineers have been ordered by the department.

- Armed Forces Special Weapons Project soon will get responsibility for guiding the Atomic Energy Commission in its work on new weapons.

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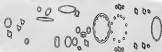
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DICK HANBLER dashes forward as second F4s aboard USS Forrestal comes to a halt, headed to arresting gear.



FORRESTAL's first two F4s being handled by the flight deck crew (left) look down on huge flight deck (right)



AMERICAN AIRLINES chooses *American Landing Airline* **Aeroproducts Propellers** for its new fleet of Allison-powered Lockheed Electras

The Lockheed Electra airliners, setting the pace for the era of jet-powered transports and now in production for American Airlines, will be equipped with the proved lines of Aeroproducts Propellers and Allison turbine engines. Both are products of General Motors.

Just as the Allison Turbo-Prop engines were selected because they are the most advanced in the world today, American chose Aeroproducts Propellers after the most careful evaluation. The decision is favor of Aeroproducts was based on rugged blade construction combined with unique features of pitch control and dependability. Results of more than ten years' intensive development. The Aeroproducts turbine propeller made its first flight in December 1945 in the first Turbo-Prop airplane to fly in the United States.

Since then the General Motors power package of Allison engines and Aeroproducts Propellers has

accumulated thousands of hours of successful flight experience in the Allison Turbo-Liner, the Air Force C-119C Transport and the Navy RF-1 "Trackdown."

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Last Ride for the F3H-1

Turkey "died" McDonnell F3H-1 Navy fighters (above) huge down Sea on Long and East, rate from St. Louis to Memphis, Tenn., Naval Air Station and ground landing duties. The Navy called a halt to the fighter's production after ending 56 and strong set of these units during tests (AVI Oct. 3, p. 12).

Principal reason behind the aircraft's failure was the Westinghouse 710 engines, whose 7,200 h.p. thrust was not enough to power the Decatur. And scale of the \$67-million program can be seen above and below (where the planes are being loaded in St. Louis) a large, but never an aircraft carrier, for the F3H-1.



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Mackey Orders Two Fokker F-27s

The first order from an American airline for the Fokker F-27 4-passenger twin-engine turboprop is now made in Mackey, Arkansas.

Mackey has ordered two of the turbo-prop transports from Fokker Engineering and Airplane Corp. and has taken an option on two more. Delivery is scheduled for late 1975.

While the Mackey order is the first from U. S. airlines, the F-27, West Coast Airlines took an option on six aircraft in December. KLM Royal Dutch Airlines has ordered two F-27s from Fokker in the Netherlands.

Fokker has signed three Fokker to build and sell the F-27 in the United States and in all South American countries last March. Fokker is currently testing the F-27 prototype in Helmond and is starting production.

The 40-passenger F-27 is designed for the DC-3 replacement market to operate in a short haul transport for routes for short-haul, long-range, transport-type routes being studied (see page 10).

Fokker is currently conducting a sales campaign in the United States in an effort to develop enough business to make production of the airplane feasible. The F-27 is a high-wing transport powered by two turbo-prop engines and has recently been expanded to accommodate up to 50 passengers.

Mackey Airlines operates between 14 domestic points and Nigeria, British West Indies. The carrier has flown over 70,000 passengers between U.S. Landers and West Palm Beach and Nigeria in the past three years. The Civil

Russian Bomber Range

The range of Russian long-range jet bombers is "broad" but the 10,000 miles covered by 12 long-range bombers, Gen. Nikolai A. Sukhomov, director of the U. S. S. R., and recently in what was his last day of the range or of his life.

Aerospace Board authorized the service in 1952.

The airline runs DC-3 and DC-4 equipment in its Florida service. Mackey is using the CAB to extend its routes from Miami to New York and Havana.

New F-102A Order Placed by Air Force

San Diego-Corner Division of General Dynamics Corp. has announced receipt of a large contract for production of F-102A all-weather interceptors and F-102A combat proficiency trainers.

Noting the number of aircraft in the order, the Air Force contract was awarded last October reported that the order is the fourth in the F-102A series and calls for greater numbers of interceptors and trainers than did all previous contracts combined.

General Dynamics produces the F-102A at its San Diego plant.

New orders for the F-102A are fabricated at General Dynamics, Fort Worth, Texas, plant and shipped to San Diego for testing with the Mustang.

Delivery of the first F-102A was made to the Air Force late in 1964. Increasing numbers of the all-weather jet's coming off the assembly line are assigned to units at Air Force training facilities. First F-102A produced a training engineering flight tests at Edwards AFB.

The airplane, which is the F-102A, is the first trainer developed specifically for use of the "fighter" aircraft.

Northrop Recruiting Canadian Engineers

The shortage of engineers in the West Coast has prompted Northrop Aircraft, Inc., recruitment from 10 top Canadian sources.

Recruits have been good and many applications have been received from men with outstanding qualifications, Northrop says. An Alcoa, however, the Canadian's most active was not a direct submission to become U. S. citizens.

An additional barrier to immigrants having such men is the month-long period required before a new citizen can be granted.



Kaman's 'Flying Barrel'

Kaman Aircraft Corp., Bloomfield, Conn., has received an immediate study contract from the Office of Naval Research regarding an "Flying Barrel" aircraft similar to the two shown in the above sketch. Kaman says the aircraft could be powered by either piston or jet engines, fixed and lateral movement and other special capabilities to control flight at point. A similar concept is under development in France.

AERONAUTICAL ENGINEERING



SYSTEM at Wyle Research Corp. tests Mach compressor turbine.



TEST supports filter for rotor precompression filter air during test.



FOUR WAY, nonoperating hydraulic valve is tested in cold box.



MODULATION SYSTEM has components made by various vendors.

Role of Test Facility Gains New Stature

By Irving Stone

El Segundo, Calif.—The increasing anxiety of military service organizations has pushed to the forefront the role of the test laboratory for the proving of aerial and missile components.

Already this pretesting of weapon components and systems is taking a considerable portion of the defense dollar. Design performance of aircraft and missiles still in the drawing boards indicates that this portion will grow even larger.

How far some of the factors behind the rise of laboratory testing:

- In addition, identifying rapidly only a small part of the functional reference now required, and does not preclude operation of the numerous individual components.
- In modern aircraft, complexity of the systems prevents the pilot from gathering

information on individual components and feeding this data back to the engineer.

The specialized nature of the test requires it require a high level of technical administration, special and costly equipment, and highly trained experts in testing procedures—tasks that could be beyond the economic capacity of the average vendor or component manufacturer.

Thus, to test a \$100 valve may require a \$500,000 installation of test facilities and instrumentation.

Independent Laboratory

To meet this situation, the independent testing laboratory, typified by Wyle Laboratories and Wyle Research Corp., has evolved. To a component manufacturer, one of an independent laboratory facilities offers these advantages:

- It frees capital that would be tied up in costly test systems and complex instrumentation for which the vendor has limited use.
- It takes the vendor's laboratory for development work vital to the engineering of new items for production.
- For a reasonable fixed charge the vendor has at his command a testing facility equipped, he expects, with trained personnel and the testing facilities of the prime contractor and the armed services.

The prime contractor benefits because the test report he receives is an independent evaluation of the product.

Properly, the independent labors may constitute a portion of the prime contractor's system to accommodate different components from different vendors. This offers consistent conditions of test to accommodate with actual conditions of operation.

Wyle Laboratories, founded in 1949, specializes in combustion and environmental testing of hydraulic, pneumatic and fuel system components. Wyle Research Corp., founded in 1953, specializes in testing engine components.

Since their inception, the rate of growth of dollar volume of tests completed has approximately doubled each year, resulting in a current annual rate for both companies of about \$14 million.

The two currently are carrying the qualification testing load for about 300 engines.

Frank S. Wyle, president of Wyle Laboratories, points out that much of the successful operation and growth of the company stems from the close teamwork between the laboratory and vendor in solving a problem through the qualifications testing associated with qualification testing.

Environmental Facilities

To qualify aircraft and missile engine components, an essentially wide range of environmental, functional systems and instrumentation is required.

Environmental test facilities fall into two categories—thermal and indirect. A natural environment is one such as a temperature extreme, humidity or a corrosive atmosphere. An indirect environment is one such as vibration, shock or acceleration.

To accommodate a large number of component testing programs, several

machines. Wyle has developed extensive test stations. For example, the low temperature system includes a storage tank which holds 12,000 lb of liquid CO₂. This tank is maintained at -100 F in mechanical refrigeration to keep the system pressure at 400 psi.

The cold liquid is pumped throughout the laboratory to provide a source of low temperature at approximately 30 locations.

Direct exposure into a chamber can drop temperature from room value to -100 F at 30 sec.

With the flexibility this system allows, simulated ambient temperatures at -65 F can be maintained. As an example, for testing a pilot's seat, Wyle's had an engine regulator carrying high mass flow at 700 F.

Functional Test Systems

Functional test systems at Wyle include eight test rigs capable of flow as high as 3,200 gpm. There are test stands for qualifying all types of hydraulic components, including electrically operated hydraulic servo valves and components required to handle fluids at extremely high temperatures.

In the field of pneumatic, high pressure static components are fitted with the aid of a 5,000-psi compressor. High pressure hydraulic tests required for components operated by jet engine bleed air are furnished by an 550-psi air system. The high temperatures are obtained for the tests by a gas-fired 2-million-Btu heat exchanger.



RATE-OF-TURN table used for precise calibration of accelerometer and gyro.

Complete systems have been set up for testing engine components. Thus, a complete hydraulic rotor system has been installed so that engine components of rotor manufacturers can be tested for compatibility with the various rotor systems environmental conditions. Thus, of course, is in addition to basic qualification testing for individual component requirements.

Vibration Tests

In addition to providing for vibration testing in accordance with existing military specifications, Wyle has extended its vibration facilities to fluid vibration tests with complex wave forms may be accomplished.

Vibration information from actual engine installations under actual operating conditions may be tape-recorded and this data played back through the shaker system in the laboratory to provide the test conditions which simulate actual operation.

This approach has shown growing acceptance to operating characteristics of these such as pressure pulsations, pressure fluctuations, shock waves and ripples, which did not show up under normal specification testing.

Fire Control

Problems of fire control in high speed aircraft and guidance problems with missiles have accelerated the development of instruments which sense rate, position, Mach number, temperature and acceleration to a higher degree of accuracy than is usually found in laboratory type instrumentation.

To calibrate this new category of instrumentation, Wyle has equipped a standards laboratory which is equipped to measure electrical quantities to 1 part in 10,000, rate to 1/100 degree per second, angle displacement to 1/100 second of arc, temperature to 1/100 degree C, pressure to 0.05 millimeter Hg.



TEST SETUP for functional check of electrically-operated hydraulic servo valve (lower).



Four Cincinnati mills working on Cincinnati plant. The size of the job is increasing with world wars.

The top left of center is working on a job for the U.S. Army. The bottom left is working on a job for the U.S. Navy. The right is working on a job for the U.S. Air Force.

• CECOSTAMP •



There is a stamping plant in a Cincinnati plant. The size of the job is increasing with world wars.

The top left of center is working on a job for the U.S. Army. The bottom left is working on a job for the U.S. Navy. The right is working on a job for the U.S. Air Force.

• CECOSTAMP •



At Cincinnati plant in a Cincinnati plant. The size of the job is increasing with world wars.

The top left of center is working on a job for the U.S. Army. The bottom left is working on a job for the U.S. Navy. The right is working on a job for the U.S. Air Force.

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Stock Transactions

Washington—Acquisition of 10,000 common shares of United Air Lines stock through exercise of option by W. A. Patterson officer and director is reported by Securities and Exchange Commission for the period of Nov. 11 to Dec. 10, 1945. He now has a direct holding of 11,000 and an indirect holding of 134 common shares. Two officers of the company also acquired shares through an exercise of option. A. M. McVernon, acquired 350 common common shares and Hal J. Naves acquired 1,040 common shares making a holding of 1,390.

(Other recent transactions reported include:

ACF Inc. holding 200,000 of 200 common shares by J. H. de Vries, director, holding a holding of 100.

Law, Sargent W. H. de Vries, director of 1,000 common shares, the first holding of 1,000 common shares by W. H. de Vries, director, holding a direct holding of 1,000 and an indirect holding of 1,000. W. H. de Vries, director, holding a direct holding of 1,000 and an indirect holding of 1,000. W. H. de Vries, director, holding a direct holding of 1,000 and an indirect holding of 1,000.

Shaw-Walker Inc. holding of 100 common shares by E. H. de Vries, director, holding a direct holding of 100 and an indirect holding of 100.

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Aircraft Demands Exceed Pilot Capability

The Air Force is urging a fresh look at the problem of human error: a factor that must bear responsibility for approximately 1,200 of the 1,500 or so major USAF accidents over the last ten years. To reduce the number of accidents caused by this cause, it is necessary to consider the human in terms of the inherent design limitations," according to Brig. Gen. Joseph D. Gidley USAF, Director of Flight Safety Research.

Speaking before the Los Angeles section of the Institute of the Aeronautical Sciences, Gen. Gidley pointed out that "human error" does not necessarily represent the pilot's culpability, as would often be the case in the past, but is often placed in a situation where demands were greater than his ability to respond adequately.

The scope of the accident problem is indicated by the fact that while USAF's major accident rate is down to between 18 and 39 per 100,000 hr of flight time, the latest in Air Force figures show that 3,754 major accidents in the 12-month period from July 1954 through June 1955. In these accidents, 282 of which were fatal, 810 persons, including 818 pilots, were killed.

Most Dangerous

The inherently greater risk involved in flying jet fighters is reflected in the fact that they were involved in more than half the major accidents during that period; the flight safety research chief said—80% in the last six months of 1954 and 45% in the last six months of 1955.

The figures for other types of aircraft for these two six-month periods:

- Jet trainer: 105, 174.
- Jet bomber: 16, 23.

Brig. Gen. Gidley

Brig. Gen. Joseph D. Gidley, USAF, was named director of USAF flight safety research last April after resigning as its in division commander with the Strategic Air Command and as a staff officer with the Joint Chiefs of Staff.

During World War II, he served at U. S. Armed Forces Headquarters in the South Pacific as assistant chief of staff for operations. He later became chief of staff of the 48th Air Command, A-193 graduate of the University of Maryland, an aviator in the Legion of Merit and the Air Medal with six oak leaves.

- Non-jet bombers: 16, 24.
- Non-jet trainers: 145, 307.
- Transport and cargo: 47, 60.
- Helicopter and miscellaneous types: 27, 26.

Gen. Gidley emphasized that the major problem of the Air Force at present is not the jet fighter and jet trainer fields which suffer the highest number and rates of major accidents. In 1950, jet fighters and trainers accounted 50% of the flight time and accounted for 31% of the major accidents; 35% of the minor accidents, 15% of all aircraft destroyed, 13% of the pilot fatalities and 90% of the total dollar loss.

Land, jet fighters and trainers by 20% of the losses but lost 65% of the major accidents, 66% of the minor accidents and account for 73% of the aircraft destroyed.

Control capability of the Air Force depends upon sophistication, leading to this problem. Gidley took issue with the "impact on the control of the people who sent men these aircraft cannot be overestimated."

Accident Causes

Study of the major accidents shows that the reason back down into these categories, Gen. Gidley said:

- Pilot error: jets, 45%, non-jets, 52%.
- Aircraft maintenance: jets, 25%, non-jets, 4%.
- Malicious failure: jets, 23%, non-jets, 12%.
- Secondary error: jets, 4%, non-jets, 1%.
- All other jets, 24%, non-jets, 14%.

The "all other" category includes:

crashes when, causes are malfunctions but a sizable percentage of those, to the cause of pilot error, can be attributed to pilot error, maintenance or material failure. Gidley believes. All in all, human error is responsible for two thirds of the major Air Force accidents, he said.

Analysis of aircraft accidents must include the phase of flight during which the accidents occurred, Gidley pointed out.

Accident Break Down

This is how the accidents break down, according to flight phase:

- Landing: jets, 45%, non-jets, 55%.
- Flight: jets, 32%, non-jets, 23%.
- Takeoff: jets, 16%, non-jets, 11%.
- Post-landing, taxiing, miscellaneous: jets, 7%, non-jets, 12%.

Other pertinent points in Gidley's address:

In order to consider the pertinent human design limitations, the role of the human in the man-machine relationship must be defined, to its simplest basis, the man-machine relationship may be conceived as a closed circuit.

The functioning of an operating machine is undoubtedly presented in the form of an instrument.

If it is to perform its function, adequately, this machine must accurately reflect the basic operation of which it is a presentation, and it must be designed that changes in the basic operation are rapidly and effectively reflected in the instrument.

In the second step, the instrument is perceived by the human through a receptor system. In order for this process

Accident Rate at Record Low

The Air Force's major accident rate was down between 18 and 39 per 100,000 hours of flight time. This is the low point in a curve which shows that the accident rate has been consistently down since 1921, except for a temporary increase when the total war effort.

The exception period 1946, when busy demobilization stopped the Air Force of some of its experienced pilots, experienced and maintenance personnel, beginning of World War II, when the Air Force started to expand rapidly, and 1954, when the Air Force took over the job of flying the air staff with inadequate equipment and facilities.

The today rate—number of fatalities per 100,000 hr—was 4, compared to 84 in 1921. The today rate—number of accidents in which someone is killed per 100,000 hr—was 4, compared to 70 in 1921.

However, reflecting the higher performance and speed of today's aircraft, not one of every five major accidents today is a fatal accident, in 1936, only one out of every 13 major accidents resulted in fatality.

ception to take place, the instrument must be designed so that the presentation is well within the human limitations of the human receptor system. Further, it must be presented so that a minimum of time is required for an accurate interpretation of the presentation.

In the third step, the perceived and interpreted information presentation is used as a basis for controlling a response. In the case of a pilot, this response should be simple and very easily learned.

The human response is then the means by which man-machine control system is activated.

Complicated Situation

This control should be directly associated with the basic operation of the machine in question so that manipulation of the control are directly reflected in the activity of the machine which again is directly and accurately perceived as a modification of the instrument reading. This then comes to

action, the human operator is to whether or not additional control changes are necessary.

In the case of a simple system is complicated, in the fact that in a complex piece of equipment, such as a high speed, high-performance aircraft, many functions of the basic instrument are acting as an integrated unit and are necessarily perceived by means of a complex instrument system. The human operator in addition to interpreting the information presented by the instrument, must also integrate information presented outside the cockpit and at times—far distance during a takeoff—must integrate data of those with instructions obtained by reading a relatively complicated chart.

If the demands of the situation exceed the limitations of the pilot in the brief time allowed the pilot will quite possibly be in inadequate reference of the information received. This results in a fairly complex which, in turn, leads to the wrong response.

In this complicated setting, the re-

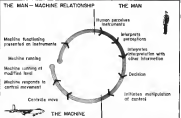


Diagram shows action and response relationship between the pilot and his controls.



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components are sealed in a dry, inert
gas. Temperature cycling can't cause
condensation inside the case; the

switch can't freeze because all mois-
ture is sealed out. Hermetic sealing
also prevents against oil saturation,
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Aircraft Switches for Every Application



"The Leading One Switch"
Many exist in various sizes
metal and alloy for use in
aircraft and military equip-
ment for emergency alarm
and other applications.



Fig. 10-11

When flap down and the
propeller spinning, switch in-
stantaneously operates four
75 amp, 28V DC circuits.



Rever Switch

How used in today's modern
aircraft for hydraulic and en-
gine control in many appli-
cations.



Post Lock Limiting Switch

Inter-locks the main engine
control after the engine has
started.



Door Switch

Many aircraft use this type
switch for door opening and
closing. Extremely small
package.

space is all too often not a simple
matter of a single control which
directly results in the desired reaction
one of the basic functions, but is
rather a complicated multiplicity of
actions which must be integrated in
order to affect the total operation of
the mechanism in the desired manner.
This requires the manipulation of many
cross types of controls, dials, knobs,
levers, etc., each of which affects its
own small portion of the total opera-
tion.

The total result of this is a modifica-
tion of the integrated functioning of the
entire mechanism which is again af-
fected in the basic system operation.
This presentation must then be re-
spected. This continuous perception
and integration of continuing informa-
tion from a variety of sources must be
carried out by the pilot in addition to
other required activities.

Man's Limitations

Although not as readily apparent as
to the machine, there are in the human
mechanism which cannot be easily re-
spected. Any attempt to design a machine
which the human must operate and/or
control which extends these human
limitations can result in serious and
undesirable operation of the equipment
and, all too often, destruction of both
the equipment and the human operator.

Whether the physical sensory, physio-
logical or psychological aspects of the
human are considered, these limitations
are important.

As a physiological structure, the
human operates according to the laws of
mechanics. He is a system of weights,
counter weights, levers and pivots.

Some of the limitations of the human
as related to such a system are ob-
vious. For example, he can only work
so far and lift so much. There are
other limitations, however, which are
not so obvious but which are very
important, especially in terms of the
ability to operate high-speed, high per-
formance aircraft.

For example, the mechanical trans-
mission of a light stimulus from the eye
to the brain and the subsequent action
which results from the interpretation of
such a stimulus takes a time-consuming
process which can vitiate almost the
successful operation of an aircraft.
When a light stimulus strikes the eye
and from there is transmitted to the

First Accident

Result of USAF's Directorate of
Flight Safety that the first Air
Crew accident took place in 1936.
The victim, Gerald Knight, killed
by Lt. Wm. Schulz, flight surgeon.

Engineered for
tomorrow's needs...today...



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Converting accuracy with complete design,
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drift and error. All digits are available locally
simultaneously, allowing a high reading rate and easy
to read while the shift is in motion. Built-in library
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RANGE: 0-100 up to 100 per second

POWER: 100W—directly coupled to external circuitry
CONVERSION: 100W—directly coupled to external circuitry

TEMP: 100°C or higher tolerance

WEIGHT: less than 0.2 inch cubic foot (input shaft
1/2 inch diameter)

CONVERSION: 100W—directly coupled to external circuitry

AVAILABLE IN ANY CAPACITY TO 10,000—other capacities
available on special order

For full details write for File #131.



NORDEN-KETAY CORPORATION

Engineering and Design Division
New York, New York

CONVERTING ACCURACY: 100W—directly coupled to external circuitry
CONVERSION: 100W—directly coupled to external circuitry
TEMP: 100°C or higher tolerance
WEIGHT: less than 0.2 inch cubic foot (input shaft 1/2 inch diameter)

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★ World speed and altitude record holder for piston aircraft... B-57 record proved Bell 54 A

Like the high altitude missile its rocket engines have powered, Reaction Motors, Inc. has covered a great distance in a short time. As America's pioneer rocket engine producer, RMI gave this country its first practical liquid-propellant rocket powerplants and has engineered many barrier-breaking "firsts" in helping to keep our country strong.



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human nuclear-perception-response sequence were essential precisely, a solution could be avoided. If even a few, were taken in any one of these steps a collision would be inevitable.

In view of the fact that it can be safely assumed that the speed of man's mind will improve while the response time in the human will remain unchanged, the necessity for recognizing the importance of these human levels becomes apparent.

Desired vs. Capability

The accomplishment of any task can be looked upon as an integration of two variables. One of these is the level of the operator's ability, the other is the level of the demands of the situation. As long as there is a wide margin between these two, the probability of successful accomplishment is high. But as increases in the demands of the situation or a decrease in the individual's ability will decrease this margin and thus result in a situation with which the individual is not capable of coping. There are many indications that this high speed, high performance characteristic of modern aircraft have caused the demands made on the pilot to the point that the probability of successful achievement is considerably lessened. This is demonstrated by the fact that while accomplishing overhead of the flying time, jet aircraft experience approach crash, thousands of the major USAF aircraft accidents.

In order to be successful, it is essential that all pilots and crew members understand what it requires, and manage their aircraft accordingly. Due to the speed of aircraft flight and varying instrumentation and equipment, it is essential that pilots be able to accomplish tasks quickly and accurately. Thus it is essential that aircraft be so designed that this pilot is given the maximum of assistance, so that he can accomplish his tasks without delay, error or difficulty.

Review of aircraft accidents, however, reveals that design considerations can help to facilitate the pilot's task and even on occasion, prevent, and completely the occurrence of flying to the point where human error is involved. Examples of aircraft design which can reduce pilot error are as follows:

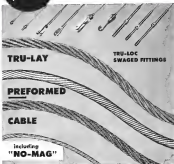
Design and Perception

Examples of design factors which can help after the pilot's ability to perceive quickly and easily conditions during critical stages of flight. Among them:

- Visibility from the rear cockpit of jet trainer. During the calendar years 1952 and 1953 the USAF experienced 43 accidents in which poor vision from the rear cockpit was either a definite or probable factor. Thirty five of these were

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major accidents and 11 fatalities resulted. Research in this aircraft is utilized extensively for training purposes. The instructor pilot who occupies the rear seat needs to observe the student as it contracts and needs to be released, conditions in case he has to assume control of the aircraft.

The design of the aircraft is such that there, visual requirements are compensated in looking and aircraft accident record.

• Position of radio in high-performance aircraft. During the past few years a specific pattern has been seen to emerge in numerous instances in unexplained flight or jet intercept accidents. The pattern is roughly as follows:

- (1) The aircraft is put taking off as in the early stages of the landing pattern.
- (2) The aircraft altitude is approx. 2,000 feet.
- (3) Strong turbulence is felt.
- (4) The pilot is often in a pre-occupied state.
- (5) The pilot is requested to change radio channels or modes.
- (6) The pilot replies to the request stating that the change is being made.
- (7) The pilot immediately thereafter strikes the ground at near current altitude.

In seeking an explanation of these accidents the position of the channel and mode selector nearest controls is.

Almost without exception the radio real in channel and mode selector are on the right console and in some cases they are in a position which is difficult to reach.

Therefore, changing radio channels or modes means that the throttle must be shut down and the aircraft must be flown with the left hand, and, frequently, that the pilot has to turn his head to the right and look down and use his hands to reach the controls to find the channel or mode selector and electric changes which must be made.

The pilot who cannot actually locate or reposition his instruments may also consequently lose in the control of his aircraft. While flying at 450 knots at 7,000 feet above the terrain, an unguided or uncorrected, guided aircraft can strike the ground in less than five seconds.

Design and Understanding

There are numerous examples of various instruments which are difficult to read, displays which are difficult to understand, and indicators which are difficult to interpret have led to aircraft accidents.

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Like all ESN's Step nuts, those in the new LH series are self-locking, vibration-proof and high reuse is guaranteed.

months, misinterpretation or miscommunication of the control of fuel systems is becoming a significant cause of accidents.

As example. Recently a jet bomber was on a routine training flight with the instructor pilot in the rear seat and the student pilot in the front. Approximately an hour after takeoff the aircraft was observed by witnesses to be flying at a very low altitude and then to stall, spin and crash shortly prior to the crash both the instructor pilot and the student pilot attempted to escape by use of the ejection seats but both were fatally injured due to the low altitude when they abandoned the aircraft. Investigation of this accident revealed the following:

a. Both engines were windmilling at the time of the crash.

b. There was no evidence of control failure.

c. The accident occurred at approximately the time when, through manual fuel tank sequencing, the wing tip tanks could be turned on.

d. The student pilot had not turned on the wing tip tanks but instead had closed the center fuel tank valve.

e. Subsequent to the loss of power the pilots allowed the aircraft to stall and enter a spin at an altitude at which a recovery could not be effected.

The above evaluation of this accident lies in the following factors:

a. It was the student pilot's first solo in the aircraft.

b. Fuel management was possible only on the fuel control which was occupied by the instructor pilot.

c. In this model the instructor pilot could not use the student pilot or observe any of his actions.

d. In this model the fuel control panel at the instructor's seat is a non-removable one to confuse the wing tip tank control knobs with the engine fuel control knobs.

e. In essence, the student's mismanagement of fuel control, which was caused by the design of the fuel control panel, went unobserved and uncorrected because of the design of the tandem cockpit.

Design and Management

The flight safety research cited cited three additional design faults which it concluded as to be critical reasonable opportunity for correct management of flight is should the serious error, allowed the reasonable chance of survival.

All design used in control of the aircraft must be accessible, must respond to normal human strength or desire, and must be reliable.

Factor to meet these premises have led to repeated accident records and a number of fatalities. Examples:

• **Strength and desirability.** There have been several occasions when pilots in jet trainers have attempted to abandon the aircraft under emergency conditions and have been unable to jettison the canopy and who have subsequently gained control of the aircraft in non-vented crash landings. The reason they were unable to jettison the canopy was due to G forces encountered, they had insufficient strength to reach up to the canopy release lever.

It is pertinent to note that during the period 1 Jan. 1949 through 31 Dec. 1951 there were 40 fatal accidents in jet trainers where the altitude of the aircraft at time of the emergency should have allowed reasonable escape but the canopy did not jettison the aircraft.

The canopy also was unable to jettison because of inability to reach the canopy jettison handle in cramped but probable situations.

• **Reliability.** The accident for reliable instruments and particularly, in light, attitude instruments is obvious. Type attitude instruments are the responsibility of calibrating the pilot at his position and direction which, too, using space in unreliable space. Yet, design-wise, the gauge readability has at times been compromised or neglected. As example.

As example, in a fighter where the turn and bank indicator is set in a position 15 deg off the vertical plane of the aircraft. As a result the turn needle indicates a turn opposite to the direction of roll as long as the roll is continued.

Latitude in Design

The conditions and examples cited could be considered as indicating indifference on the part of designers. Some of the design deficiencies have been dealt with at Air Force specifications or situations which allowed no alternatives, and that design after safety from personnel, development. However, in design and manufacture there is a reasonable degree of latitude, and there are penalties for corresponding improvements.

Considering the intrinsic limitations of man and his propensity for error, it is argued that extraordinary thought be given to the design of those things the pilot must use, understand and handle, in order that he may continue to live in the existing environment of high performance flight.



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GLA

AIRCRAFT IGNITION AND ELECTRONIC EQUIPMENT

WHO'S WHERE

(Continued from page 21)

Paul Stocker, manager, General Development, General Electric Co., Los Angeles, California

Dr. Gordon Melling, chief metallurgist, Research and Production Department, Hughes Aircraft Co., Culver City, California; Dr. K. R. Leland, senior research director, W. W. Duka, quality control manager, Whittaker plant, applying Dr. Melling; Dr. E. F. Kinnell, associate director of research, in place of Mr. Duka

Ralph W. Rosen, chief engineer in charge of new installed engineering department, Twisted Metallurgical Corp., N. Chicago, Ill.

P. Nelson George, senior design officer, Leland Aircraft, Ltd., England; recording Corp. Capt. S. D. Taylor, engineer

Edward S. Hays, general sales manager, Union Electrical Instrument Co., New Orleans, N. H.

Carl Egan, Vice President, photo manager, General Products Sales, Christian Electronics Division of Gen. Corp., Irving, Ill., N. Y.

Superior Leader John S. Smith, chief test pilot, Standard Oil Co., England

J. Robert Connor, senior research supervisor, General Electric Co., Light Machine Research Department, 131st St. Y. General S. Hart, marketing manager, Special Defense Projects Department, Science, N. Y.

Charles A. Dupont, director, overall test pilot, Boeing Research, Inc., Reading, Pa.

E. J. Sin, sales manager, Avion Corp., Newark, N. J.

Robert G. King, senior sales representative, in Chicago, Air General and British Aircraft, William G. Wolf, American, New York, N. Y.

Richard H. Stern, general sales manager, Ford, Ben. Gen. S. Michael Corp., Chicago, Ill.

Frank M. Helling, manager, Design, Gen. office, Standard Oil Products Co., Los Angeles, Calif.

Frank W. Fitts, project leader, engineering Department, Alper Products Co., Detroit, Mich., N.Y.

James W. Smith, chief engineer, expert, Walter Manufacturing, Inc., Westfield, Mass., William J. McGraw, Jr., chief technical officer

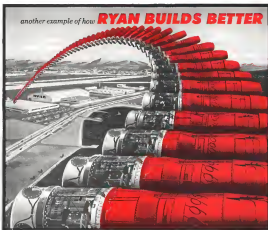
Lawrence Fanning, regional National Bureau of Standards Metallurgical Section, to evaluate technology standards for plant and machine

Charles F. Kinnell, research and development, Avion, Inc., at Wright Patterson AFB, Dayton, Ohio

Frank A. Farrow, manager of government sales, Thompson Products, Inc., Accurate Division, Cleveland, Ohio

Keith G. Cox, director of all purchasing activities at General Aircraft Corp., Lincoln Park, Ill., plant

Frank G. Wiley, sales manager, Scott Corporation of Texas, New York, N. Y., Warren Schenck, sales representative



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BUSINESS FLYING

Aircraft Radio Booms Commercial Sales

By Erwin J. Bethen

Boston, N. J.—A new Tech G50 Two-Business communication flying telephone and teletype is being modified by Aircraft Radio Corp. to speed-up a scheduled date to greatly expand the company's commercial sales of radio and teletype equipment in 1958.

For many years after its founding in 1928, Aircraft Radio was known as a military supplier. It went into the commercial aviation market shortly after World War II. This program was interrupted, however, by the Korean war and increased military purchases in the years immediately afterwards.

In 1954, the commercial sales were about 10% of total business but rose, according to company figures, to about 35% in 1956. In 1956, ARC expects first in commercial aircraft program will account for 40% to 50%, with attendant increases in civil research and development.

It is Gertsen, ARC's commercial sales manager, who says that, "Finally, we are not so changing for the corporate aircraft market."

Two factors weigh heavily in this emphasis on the business aircraft market.

• The company's growing concern over a lack of profit in the military services in guarding manufacturers' properties, rights—a sure profit should be all branches of the aviation industry (AVM Nov. 7, p. 21). ARC officials point out that there have been several cases where the military agency has based cost drawings furnished by the company with estimated material to competitors when rendering items that it was were already developed with its own funds. Low profit margins and problems in selling the military is also mentioned by company officials in explaining their interest in commercial markets. "Generally we don't feel the effect of our military sales efforts for those to be—our own commercial."

• The business aircraft market has more vitality than that of the airlines, Aviation Week, says. It is, ARC spokesmen said, because military operators buy new equipment far more quickly than do the airlines, whose industry they estimate is on the average of about 10 years old. "We could produce any new equipment to make for the airlines for their replacement in about four months, leaving us unoccupied for long periods," he noted. As a result

the company has not been too active in initial equipment, 4 slots.

When Aircraft Radio's new supplier Two-Business leaves the company's Boston, N. J., airport on the site of a series of demonstrations within the next few weeks, it will be carrying more \$20,000 worth of ARC electronic radio and teletype gear in addition to new equipment undergoing flight test.

New Instrument Panel

Approximately 1,800 machines will have gone into making the airplane for its new mission. Most obvious modification is the new instrument panel. ARC took the better version on a slightly and, whereas it formerly slanted forward, it is now vertical. Not only did this panel, about 15 inches wide depth at the top of the panel, but it will also give better instrument visibility. The standard panel usually slanted forward, he said, to pick up the distracting reflections of outside light.

Duplicate communications, navigation and flight instrument systems are being installed, one on the left for the pilot, the other on the right for the co-pilot. At the right is a panel which will contain experimental equipment

under test.

To permit easy and quick removal of the bread, the company has modified vertical flap doors 57 1/2 in. high with 5 inches clear width between them. The flap has interior holes every 2 inches. Any equipment can be replaced by simply opening flap fasteners, disconnecting the instrument and pulling it out.

The instrument panel the Two-Business will be carrying the equipment. Dual Type 13D VHF long-range receiving gear, R16 VHF communication receiver and three 1-22 VMD transmitters providing 10 channels, B20 multi-frequency, dual 1-11A modulation amplifier, dual GE 1000 electronic and the new AER Type 21, which will be flight demonstrated for the first time.

The airplane's new baggage compartment will carry experimental flight test equipment. Since this section will not be tested and is subject to the same vibration, it will be ideal for proving new products.

To handle the wing load, ARC has installed 170 knots from the front baggage compartment to the rear baggage compartment, which stores the passengers. It agrees that it has about 25% reserve loads for future needs, with an air-



New Zealand Gets Fletcher Farm Planes

First new delivery of U. S. built Fletcher FM-24 Utility aircraft was made to agricultural operators in New Zealand, where the planes were assembled, during ceremonies attended by top-ranking government officials. Seven of the 10 FM-24s flown away after receipt of Certificate of Acceptance on the tarmac at Auckland Airport. The planes will be used in New Zealand's large rural fertilizing program that has been developed by a cabinet member as being done even ahead of any other nation.

Cable Price Corp., Ltd., has contracted to receive 300 FM-24s in 300 lots for assembly in New Zealand.

rated correct proportion of legs, small and thickened were for all configurations.

All equipment is supplied by reference to the C-59B dual 10-hertz generator. Christensen estimated that with all possible electronic equipment on cutting drive will be approximately 3500 lbs.

Complete weight of demonstration equipment will be under 150 lb.—ARC says that a comparable installation of competitive gear would weigh between 350-600 lb.

A single installation of the ARC equipment would weigh approximately 110 lb., installed, but dual installation weight has become rather heavy and

may not have to be duplicated.

Company-owned airplanes have been a vital factor in selling Anco-Radio products. ARC also has a Beach Bonanza and a Ryan Navion. The latter pair is approximately 225 lb. aircraft, light landing gear equipment and needs facilities.

The Bonanza demonstration has been averaging approximately 450-610 hr a year in its last three years of service it served 5,400 people aloft. Given the company, had the Bonanza at Wright AFB demonstrating ocean equipment and took 52 people up in a two-day period, on another test (two weeks duration) the company's equipment was

demonstrated to 150 people in the air.

The Bonanza also is credited with closing a deal with a sales order that Anco-Radio was anxious to get into the dollar field. The company's donation demonstration to support the project that he fitted the Bonanza with the same equipment and in eight months was in the top 10 in sales an ARC's loss. We figure that our studies had two and a half times better in 1955 than in the previous year because of the additional demonstration time we put in last year," the ARC commercial sales manager said.

The larger Ryan Bonanza is expected to meet its own new impressive record. Christensen calculates that the airplane should put in about 900 hours a year and with the ability to carry five prospects aloft at a time will mean that double the Bonanza's capacity. (Loaded with equipment and instruments, the Bonanza usually could only take up two prospects at a time.)

Christensen expects to pile up important sales gains using the Ryan Bonanza.

The Ryan's sales demonstrations with the new C-59 should build up impressive sales for the company, based on past experience with the smaller Bonanza. For one thing, this line should pay C-59 coastal aircraft sales, Christensen would not get about one third of the U. S. and the whole West Coast have not had demonstrations of the equipment. Some 200 of these \$2,700 units are in use in corporate aircraft and several hundred in about \$100,000.

Prospects will also get three feet

lights with the new 20 lb. ADF Type 21, which has only been displayed statically at a few meetings up to now. But as, company sources say, that is looking for this equipment, which will be available later this year, is now about \$250,000. Price is in the \$2,000-\$2,500 range.

Christensen considers the Ryan Bonanza the ideal aircraft for his purposes. He picked the type following a survey of the other available airplanes and said that only the C-59 offered the

space and a good travel he required. Close grouping of prospects in another aircraft, he said, is that they can watch what is going on without losing Anco-Radio's view. With a C-59 demonstration, with delicate instrumentation of the cockpit, finding that a large airplane would increase down station potentials. But it didn't work out because the lack of proximity to the cockpit dampened prospective interest and the company sold the airplane.

Aviation Distributors Get New Role In Federal Telephone Sales Plan

A nationwide sales organization will bring aviation distribution to market in aircraft equipment as well as aircraft products has been established by Federal Telephone & Radio Co., a division of International Telephone & Telegraph Corp., Clifton, N. J.

Federal said it made the move because it feels that quality, continuous and consistent equipment maintenance experience of aviation distributors makes them a natural to sell and service its industrial lines in addition to the civil aircraft products it will be putting on the market.

Backed by this sales concept is such a large organization may have important repercussions on the current pattern of aviation distributorships and perhaps further participation in similar programs by other concerns.

Federal's move should have three immediate influences on its aviation distributors:

- Distributing their products into maintenance lines will level national pools and values in their current markets.
- It should enable them in some cases to cover the backlog of high level overhauls, enabling them to bring down charges on aircraft operations.
- Contact with industrial concerns, plus the use to market aircraft sales, in the case where this firm already is a plane customer, that will give it an edge to attract the prospect in purchasing the new products.

Federal's new distribution program divides the U. S. into six major sales territories. Distributors are currently handling 25-30 m/c mobile radio units, portable dual automatic telephone systems, adaptable to provide control and dispatch and recording. In the aviation field Federal plans a major program to install and maintain aircraft navigation and communications equipment. Initial steps in the program will include the Texas navigation system and a new low cost autopilot.

The distributor organization consists of Atlantic Aviation Corp., Teterboro,

Napco, N. J., metropolitan N. Y. and New England regions; Atlantic Aviation Service, Inc., Wilmington, Del., middle Atlantic region; Woking, Reynolds Corp., Chicago, Ill.; Midvale, Pacific Aerospace Corp., Berkeley, Calif.; Pacific Coast, L. B. Smith Aircraft, Inc., Miami, Fla.; Southern area, and Southwest, American Corp., Dallas, Tex., Southwest region.

In the first week ended December 31, Atlantic Aviation, Teterboro, sold 11 telephone systems to industrial organizations and 75 mobile radio units to manufacturers, law and truck fleets, police and fire departments.

W. E. Richards, Atlantic Aviation vice president, states that demonstrating the system in operation is the major factor in closing sales. He has rounded the telephone system of his Teterboro airport facilities and a mobile radio unit in one of the company's station wagons. Atlantic has also set a qualified electronics engineer on the ground to sell and service the equipment.

Low-cost Autopilot Nears Production

Production engineering is underway on a new low-cost autopilot designed to perform phase-out functions and subsequent test for approximately \$2,800 when it goes on the market into the market.

The unit will be offered by Anco-Radio Corp., Bridgeport, Pa., aircraft hydraulic manufacturing plants recently acquired by Federal, Inc., a wholly owned subsidiary. The autopilot has been under development and flight test by Teterboro for the past three years under the direction of William H. Harris, formerly at Sperry Corp.

Design of the autopilot has been completed approximately 1,600 flying hrs on various aircraft including some 200 hrs on Anco-Radio's own Beach Bonanza. A company official says Anco-Radio Products has obtained Civil Air-

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Small ADF Control Head

New type 170 ADF control head incorporating remote head that will not work within 12 in. and require only 14-15 in. power line. The semiconductor. Shown Equipment Engineering, Inc., Dallas, Tex., also has designed an 170 ADF control head including the new control head in a standard 11x14 in. RTCA configuration. It is a semiconductor that operates right out the box of the RTCA and the control head requires a depth of 12 in. behind the panel.

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number Administration reported for Boeing installation and is now working for Piper. Eric Farris reported he reports that the area weighs about 50 lb. installed in a Bessie and requires no electrical power to operate. The autopilot is designed as a backup, which would enable all manual services such as altitude control, approach computer and ocean heading beam to be included later.

At present, Aerotec Products and that it plans to hold off demonstrating the unit until after it has secured its dealer status. The company plans to distribute the equipment through authorized business plane dealers.

Also in the works at the time, Aerotec is a lightweight autopilot device not requiring electric power.

PRIVATE LINES

Field Aviation, Ltd., Ontario, Ont., is adding a lounge to its Calgary, Al. base, here to expand business flying services. Firm also has facilities at Ontario, Ottawa, Toronto, Winnipeg and Vancouver.

Yee and Instruments is a production booklet containing details for Col. Joseph B. Duckworth (USAF, ret.) joining elements into an getting maximum use out of instruments for field weather flying. Copies are available gratis from local Los Angeles.

Civil Aeronautics Board's proposal to require large aircraft registration numbers and letters has been dropped due to opposition from industry and air traffic control. USAF Air Defense Command's desire to have the idea placed into effect to ease its aerial intercept and identification job. A war time of aircraft numbers have gone to large supplies on their planes. American Oil Co. uses 15-in. letters and numbers as the central key of its corporate identity.

Use of parachute flares for night emergency landings is covered in detail in Aeronautical Bulletin 17 issued by University of Illinois Institute of Aeronautics, Urbana, Ill. Actual tests by the University using a Beech C45 Bonanza, Piper Tri-Pacer, Stinson 100 and Cessna 140 and 170 indicated that the flares' electrical flare showed distinct advantages over the one-minute paraffin flare.

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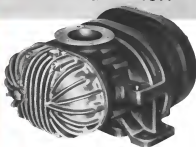
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SPURGE TESTS produced small bullet holes in stretched plate (F-102 panel lenses, left) but destroyed "in cut" energy lights.

Stretched Canopies Go Into Production

Development of stretched plates—which reflect the hazard of explosive decompression at high altitudes—has resulted the panel where full-scale production of stretched plate canopy panels has been ordered, according to Convair Division of General Dynamics Corp. Stretching, notes the panel manufacturer (AVR May 24, 1965, p. 30). The development program, according to Convair, has had the active cooperation of all aerospace manufacturers, plastic material suppliers and fabricators and the military services.

In gas tests on 3-1/2 in. x 30 in. clear plastic panels (such as Plexiglas, Gaflex), whereas the air damage in stretched panels consisted of

holes where the skin pined through the material (see photos above). In the former case, the result would have been explosive decompression at high altitude, in the latter a comparatively slow leak.

Time for Survival

The Air Force estimates that for a pilot to be able to tolerate decompression from a 7.2-psia cabin pressure to 17-psia atmosphere pressure, decompression time must be at least 0.55 sec. Based on findings in Air Force tests, ARDCM 60-1, the allowable time for such a tolerable decompression is a 35-sec. time to 40.1 sq. in.

The "in cut" panel, completely stretched for 35-sec. time, would permit

five decompressions to take place in only 0.2 sec. Today's pressure suits, unless worn properly marked, take considerable more than 0.2 sec. to inflate and would offer poor protection in such a case.

In other expansion tests, where spikes were driven through specimens of 0.5-in. thick "in cut" acrylic, a sandwich consisting of two layers of 0.2-in. "in cut" plastic separated by a 0.2-in. vinyl core, and a plate of 0.5-in. stretched acrylic, the latter again showed up best (photos, below left). The solid block acrylic in two below the spike had penetrated halfway, the laminar was held together by the vinyl, but both were cracked and would have been unable to carry any structural loads.



SPURGE TESTS resulted in cutting of "in cut" acrylic in solid panel (left) and laminated materials (middle). Stretched panel (right) did not crack.



DECOMPRESSION curves for F-102 plastic canopy in 35-sec. gas test.



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PLASTIC CANOPY on fatigue test structure at entrance to environmental chamber.

the stretched specimen allowed full penetration without cracking.

Why stretching improves the plastic's cracking characteristics is not known. One theory is that the basic structure is altered by stretching, producing a homogeneous molecular arrangement in the stretching plane. This would assist the spreading of cracks between adjacent molecular layers.

Crack Propagation Tests

One of the most important phases of the stretched plastic program has been evaluation of a good test for crack resistance, to be used both during development and for quality control.

The procedure now in general use is a crack propagation test developed by the Naval Research Laboratory in Washington. A small hole is drilled in the center of a rectangular specimen and a crack started with a knife blade. The specimen is loaded in tension at a constant rate to produce failure in 3 to 5 min. A crack resistance factor is then derived based on the length of the propagated crack, dimensions of the specimen and the tensile load at the time of failure.

Other physical properties such as tensile strength do not correlate directly with crack resistance, but can be determined from standard tests.

Which has yet to be known, however, is about the effects of use of plastic, propellant velocity and escape peak temperature. For instance, it is known that the crack resistance factor for stretched Plexiglas 45 is twice GPP at half that at plus 75°F. Despite the drop, however, the stretched material is far superior to the "as cast"

at 75 temperatures, Conway says.

The idea of stretching was born during World War II, when it was noticed that the covers of blown bubble canopies seemed most resistant to cracking. Since this was the most highly stretched area, experiments in stretching were conducted, leading to today's known edge of the field.

Two general stretching methods are employed: a mechanical system, which uses hydraulic rams and rams around the periphery of a square sheet, and a blowing method in which the composite



EXHAUST AIR GOES TO WORK on the air-powered pistons, which forcing a mix of lubricating oil in the center while simultaneously blowing over metal shims to set up and in tube stretched to the center's exhaust disc. These jobs which usually require two separate hand operations.

or cylinder is blown and later flattened. In both, temperature must be carefully controlled. If too low, the plastic will tear during stretching; if too high, crack resistance will not be improved.

Present indications are that a 70% stretch in length and width produces the best results. A 1-in.-thick cast sheet thus produces a final stretched thickness of 0.35 in.

GE Opens Production Of B-52 Turbopump

A \$45-million production program is being initiated by General Electric Co.'s River Works at Lima, Ohio, to expand the manufacture of turbopumps—pumps, 1,600 psi, variable-displacement hydraulic pumps—for the Boeing B-52 Stratofortress.

The turbine-driven hydraulic pumps convert the energy of oil fluid from the plane's jet engines to hydraulic power which is used to actuate landing gear, bomb-bay doors and wing flaps.

General Electric had held the initial development contract for pneumatic drives, including an turbine-driven hydraulic pump and turbo drives for alternators on the B-52. GE supplied the alternator drives for the experimental NB-52 and TB-52 aircraft and for a limited number of model production planes.

The B-52 is the first aircraft in which the complete accessories system is operated by gas-turbine-driven power equipment (AW Nov. 25, p. 71).

The new drives may be used to supply either electric or hydraulic power. Each unit consists of a turbine, reduction gear and controls. The range of ratings for such drives is virtually unlimited, GE says. The drives can be installed in many locations, close to the power need.

There are fewer moving parts in turbine drives than in any other method of generating power, GE says. Turbineless units are the fact that the components in these drives are similar to those which have been proven in jet engine applications. This should give the turbine very low, high reliability, according to GE.

Manufactured in the direct or simple form, GE says, because the parts are readily accessible. Furthermore, an entire unit can be removed and a new one quickly installed in its place.

With the air turbine drives operating from air bleed from the high-pressure compressor of the Stratofortress' J57 engines, a powerplant failure need not mean loss of accessory power, since the compressor air is unshuffled, and the bleed air arrangement in the air ducts would prevent damage to the engine from incorporating the auxiliary accessory power system.

Half a billion tubes used by UAP, represents a staggering number of safe flying hours. UAP tubular-type rollers built in 1925, are still giving every day service on wellpressing aircraft engines.

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Inertial Guidance: Part IV

Hybrid Systems Ease Design Problems

By Philip J. Kloss

A pure inertial guidance system depends on extremely high order of accuracy in its gyro, accelerometer, rate sensors and other components as discussed in previous articles in this series. But because further improvements in inertial component accuracy—especially, some companies are turning to hybrid systems, which employ a supplemental inertial, selected as ground reference technique to correct for the cumulative errors which build up in a pure inertial system.

A hybrid inertial system combines some of the advantages of a pure inertial system, such as complete freedom from external radiation or reference. However, for certain applications, the resulting reduction in size, complexity and cost makes this a fair trade.

One hybrid system under consideration

for use in civil aircraft in the event of an all-out emergency run angle, hybrid systems depend on the VOR/DME (or TASI) ground station.

One of the most obvious types of hybrid systems results from using a Doppler radar, whose returns are mounted on the left of the control as inside. The Doppler radar antenna is pointed forward or aft (not straight down) so that it can measure the vehicle's velocity relative to the ground.

This is accomplished by transmitting a continuous wave signal (modulated by the pulses transmitted by a conventional radar). When a portion of this signal is reflected from the ground, arrives back at the antenna its frequency will have shifted slightly from its original value. The amount of the frequency (Doppler) shift is proportional to the vehicle's velocity over the ground.

Measuring this Doppler shift both along an axis parallel to the aircraft's longitudinal axis as well as along its transverse axis, and combining the two vectors, the vehicle's true ground velocity can be obtained.

Feedback to Platform

A pure inertial system computes vehicle ground velocity by integrating the output of two accelerometers, suitably compensated for earth's rotation and other factors (AVF Feb. 9, p. 42). A signal proportional to this integrated calculated velocity is fed back to rotate the gyro-debiased accelerometer platform at the same angular velocity as that of the vehicle around the earth, so as to maintain the accelerometers horizontal. The velocity signal also is fed to a second integrator, which computes the distance traveled.

In the hybrid system described, the

accurate ground velocity measurement obtained from the Doppler radar is compared with the integrated-computed velocity. If there is any steady-state difference, then a compensating bias can be introduced into the integrator until the two velocities are identical.

If the vehicle is flying over friendly territory, where the external radiation from its Doppler radar presents no detection threat, the radar can be left in continuous mode. Under such a condition the radar might also serve as a precise velocity sensor, with the accelerometer integrating functioning as a range rate monitor error or some other high or intermediate ground terrain.

For vehicles operating over hostile territory, the Doppler radar could be operated for only a few seconds at a time at sample intervals of 10 to 15 seconds.

One company which is developing a combination control Doppler navigation system is showing for a navigation error of no more than 14% of the total distance traveled for a 10-hour cruise. Thus a 600-nm/hr bomber flying to a target 1,000 miles distant, should end up within 45 miles or less of its target.

Inertial-Pulse Radar Hybrid

An inertial system designed for use as a long range bomber or transport can suffer from the loss of the reference radar which it carries for surveillance or bombing.

When used to view known landmarks, or ground-wave beacons whose exact location are known, it is possible for the integrator to determine the vehicle's exact position. This can be compared with the position coordinates computed by the inertial system. If there is any difference, the inertial system indications can be reset to the correct value.

In a more sophisticated system, the introduction of new corrected position coordinates could serve to introduce suitable compensation to correct for inertial system bias errors which are responsible for the error in integrated position.

This type of self-correction is employed in the new AN/ASN-7 dead reckoning computer developed by Ford Instrument Co. as an adjunct to its earlier AN/ASN-6. The plot as navigates acts in the last known wind direction and velocity. However, when he acts in the aircraft's known position coordinates, the computer automatically modifies the original position wind direction and velocity to reflect the actual conditions experienced as determined from the new position fix act in by the plot.

Another way of obtaining position fixes for stabilizing an inertial system

(A) Pure Inertial System



(B) Inertial-Doppler System



(C) Inertial Celestial System



SIMPLIFIED DIAGRAMS of pure inertial, inertial-Doppler and inertial-Celestial systems.

is to make use of an automatic celestial navigation system. By obtaining a celestial fix on two stars (their altitude angle relative to the horizontal plus their azimuth position), it is possible to establish a vehicle's position anywhere on the earth.

One of the major problems in celestial navigation-free of obtaining an accurate horizontal reference—is solved when used with an inertial system which has a gyro-stabilized platform. But continuous accurate horizontal alignment.

The recently developed Kollsman Instrument Co. photonic star tracker, or automatic star tracker, provides the other key element of an automatic celestial navigation system. This is a device which is able automatically to track, pre-selected stars as planets by night, or the sun by day (AVF Jan. 15, 1958, p. 37).

A completely autonomous celestial navigation system could be formed by using two of these automatic star trackers on a single unit with dual tracking heads) mounted atop the ve-

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retail system's standard platform or atop a duplicate platform which is "dead" to the master retail platform. A spherical frequency-hopping computer, perhaps the size one uses for mobile communications, would coordinate the work.

The lateral position of a constrained educational vehicle could therefore be used to enable parallel vehicle position lines which would be introduced to convert position coordinates determined in the inertial system. Measurement bias of road side-tracker contact with a stop would not affect the accuracy of the inertial system.

If the inertial system is to be able to determine vehicle position anywhere on the earth, and serve as a complete alternative navigation system as well as an inertial system "backbone," then two structures or systems are required. If, however, the inertial system need only serve as a precise positioning reference for the inertial system, one of the approximate flight path of the vehicle is known, then a simplified single structure could be used.

Northrup Aircraft reportedly is one of the foremost firms in the field of orbital-robotic guidance (for use, as in Suni, missile). The hybrid system is an outgrowth of Northrup's original work in automatic orbital navigation.

One of man's problems warning the Air Navigation Development Board is the planning the civil aviation operators in the event of a nuclear war. "Facing an all-out nuclear holocaust, civil aviation and airline operations must be maintained. Yet if present VOR/DME navigation aids are left on continuously, they would provide an ideal navigational aid for enemy bombers."

One possible solution is a "cheap and dirty" inertial navigation system with accuracy sufficient to provide useful

The burgeoning field of inertial systems and their major components now includes a large concentration of the nation's premier organizations.

Among those active in the field are groups at A. C. Spark Plug, American Bosch Arms, Bell Aircraft, California Institute of Technology's Jet Propulsion Laboratory, Draper, Eclipse-Peacor, Federal Telecommunication Laboratory, General Electric, General Motors Laboratories, Kollsman, Radio, Lufkin, Massachusetts Institute of Technology, Mississippi-Alabama North American Aviation, Norbury Aircraft, Radio Corporation of America, Ryan Aircraft and Sperry Rand.

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completing information for short periods without its modification. At stages for circuits of perhaps five to 15 minutes, the VOR/DME signals could be stored on briefly a special adapter in the airborne VOR/DME receiver would "locate" the known-distance indications. This would enable a pilot to determine his position relative to these ground stations and thus route his aircraft enroute to the aircraft's known position. The plane would then navigate from its initial position with the VOR/DME station signals fixed on again.

A similar assignment could be completed with the proposed new long distance navigation aid, Narvik, which also provides aircraft bearing distance information.

How Big?

If a reconnaissance aerial VOR/DME navigation system is to prove feasible, the weight of the aerial package must be brought down to under 100 lbs. Several firms are known to be working on lightweight systems.

Litton Industries is developing a lightweight, low cost aerial system suitable for use in civil and military helicopters. Litton's aerial system is being tested by Dr. Henry Singleton, former U.S. man in North Vietnam handling aerial reconnaissance activities.

Singleton told Avionics Week he believes Litton can build an aerial navigation system which will weigh no more than 60 lbs., a figure which might be reduced to 30-40 lbs. in production. Such a system would have a maximum range of about one-half mile from its last position 15 after 15 minutes operation.

A spokesman for Avionics estimates that this package could build a device with comparable accuracy at a weight of about 125 lbs.

Analogies from present is a warning as a lightweight aerial navigation for the Navy, which reportedly will have an order of about one mile after one hour's operation and will weigh about 180 lbs. But Avionics Co. has been in a state of contact with Avionics Week for a lightweight aerial navigation for use in lightplanes and helicopters.

It is reported to note that the present-day gliders and in all known aerial navigation can also be used to provide signals for the control of an automatic pilot, stabilization of a flat control radar antenna or a reconnaissance mission. As well as its specific cockpit heading and attitude light systems. That the aerial system might save from 10 to 25 lbs. of gyroscopes and controls now required in civil and military aircraft.

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abroad by a German professor of applied mechanics in 1925 (Dr. Max Scheler), is fast moving into the stage of operational hardware. Fifteen years ago such aerial systems would have been considered completely beyond the realm of practical achievement for airborne use.

Despite much progress to date, the problem of obtaining accurate, more accurate and more reliable aerial components will continue to challenge the ingenuity of aerial system designers for many years to come. However, the inherent advantages of aerial systems as in-flight—when made available—will enable to navigate around the globe without ground-based radio aids, make the year 2000 the best. (This is the final article of the series on aerial navigation. The next two articles will be reported by Avionics Week. Single copies will be available on short form to be sent to Dr. Henry Singleton upon request without charge. Other copies will be mailed at \$1.00 each, plus \$1.00 for 10 copies, \$1.00 for 100 copies, \$1.00 for 1000 copies. Orders for reports should be addressed to Avionics Week, 310 West 42 Street, New York 36, N. Y.)

Avionics Companies Report Expansions

Recent Instrument Corp. will move into a 200,000-sq. ft. plant at Rossmore Field, N.Y. state, N.Y., recently worked by the Fordham Engine Division of Fordham Engine & Airplane Corp.

Other notable expansion expansion in the aviation industry include:

- **Stinson Co.**, Cambridge, Mass., under reconstruction of a new 515,000-sq. ft. plant in the William (Mass.) Industrial Center, N.Y. (which will provide 127,000 sq. ft. of office and manufacturing space).
- **International Research Machine Corp.** will soon begin construction on a \$60,000 sq. ft. expansion and manufacturing facility for its new General Military Products Div. at Chicago N.Y. New facility is expected to be in operation late in 1956.
- **Heron Corp.**, Pasadena, Calif., under of coils has increased its production capacity by 40% with the addition of 17,000 sq. ft. of factory at 777 North Lake Ave.
- **Waters Manufacturing, Inc.**, Watertown, Mass., under of precision parts and instruments, is building a 100,000 sq. ft. facility on Boston Post Road Watertown, Mass. Occupancy is scheduled for February.
- **Corning Electric Co.**, Los Angeles, under of construction, has purchased

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• Range-switching vacuum tube voltmeter automatically selects required scale and polarity (for d.c. measurement). Probe tip is insulated by an insulating coating or resistance, before probe is depressed, and instrument automatically switches to required range, preventing possible damage to instrument. Device can measure a.c. or d.c. voltage up to 1,500 v, and operates from 115 v, 50/60 cps. Bortec Laboratories, 11 Godwin Ave., Fair Lawn, N. J.

• Radio field strength meter, Model 778, for lab or portable use, measures field intensity at both AM and FM stations in the frequency range of 10 to 125 mc. It has a measuring range of 2 microvolts to 2.5 millivolts rms volts/meter. Device can provide heavy or logarithmic output indicators. Teletron Industries Corp., 5516 77th St., Long Island City 3, N. Y.

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WHAT'S NEW

Publications Received

• *Principles of Helicopter Engineering*—By Boris Sponson—Pub. by McGraw-Hill Book Co., Inc. 110 W. 42nd St., New York, N.Y. \$12.95, 453 pp. For the technician concerned with helicopter design, production, inspection, maintenance in operation.

• *Control of Inert Vectors in Astronautics*—By T. A. A. Sponson—Pub. by World Health Organization, Palais des Nations, Geneva, Switzerland. 70 pages, 10 pp. (Available in French, by 11). Summary of the problems in the design of inert vectors.

• *ASTM Standards on Flutes* (D 70) October 1955—Pub. by American Society for Testing Materials, 1915 Race St., Philadelphia 1, Pa. Heavy paper cover, \$4.75, 180 pp. ASTM standards and tentative specifications, methods of surface, methods of physical testing, recommended practices and definitions of terms pertaining to flutes.

• *Compend of Heat Exchangers*—W. M. Kays and A. L. London—Pub. by McGraw-Hill, 435 Main St., Palo Alto, Calif. \$5.95, 194 pp. Data useful to heat exchanger designers as the area of aircraft cooling in consideration, large industrial engine plants, high pressure, in cooled electronic devices and nuclear plants.

• *Men, Machines and Space*—Ed. by David M. Kays—Pub. by John Wiley, Inc., 605 Third St., New York, N.Y. Illustrated, \$5.95.

• *The Searing Pilot*—By Ann and Leroy Welch and F. G. Irving—Pub. by Simon Publishing Corp., 100 W. 42nd St., New York, N.Y. \$1.75, 127 pp. The modern pilot and the technique of wing it.



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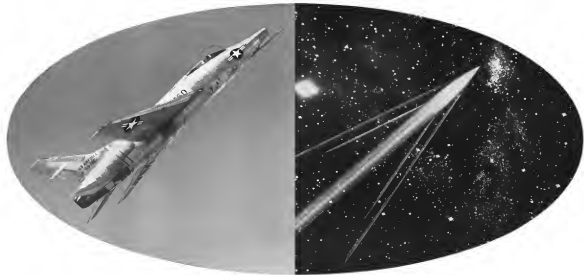
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AIR TRANSPORT

Airlines Warned on Transponder Problems

Indications are that lines will go ahead with plans to improve ground radar performance, identification.

By Philip J. Kline

Washington—The airlines were officially notified last week that recently perfected transponder beacon program might result in poorer performance than originally expected.

The warning, coming in earlier Airman's Week report (Jan. 5, p. 21), came from J. J. Talbot, technical director of the Air Navigation Development Board, which spoke before Transportation Radio Inc.'s Airborne Electronic Engineering Conference (AEEEC) and more than 150 airline and avionics industry representatives.

Despite Talbot's report, airline engineering representatives, present generally indicated that the airlines would take a calculated risk and go ahead with the program because of the pricing operational need for transponders to improve ground radar performance during heavy precipitation and to locate aircraft identifications.

A spokesman for Eastern Air Lines, which already has ordered 100 Wilco's Remote Transponders for its new Super Combi-fleet and DC-7Bs, told Airman's Week he expected his manufacturer would proceed in largely planned.

Reluctance

In A. E. Mann, Trans-Canada Airlines, said he doubted whether the airlines could afford to hold off and yet he believed the concern was, willing to take a chance on "being able to account down, as well as up, facilities" that might show up in the winter, or the airport something less than "gold plated" performance from the transponders.

Taylor made it clear that ANDB hopes for the make-beacon program and does not want to speed its earlier extensions. For this reason, Talbot said, the decision to discuss recent program problems was made with some reluctance.

"However, we don't want to unnecessarily stir people to unnecessary go ahead with buying and building transponders," Talbot said.

"We are afraid that the system may not hold the return originally expected and that we might get a reduced class of service."

ANDB wants to make extensive

system tests "in a typical operational environment," i.e., actual ground stations and other transponder-equipped aircraft before it approves the system and issues its specifications.

From the context of Talbot's remarks and his comment to question from the floor, it was obvious that military aircraft forced him to avoid detailed discussion of some of the causes of the present problems.

'Common System'

It is no secret that the civil aviation transponder is to be a "Common System" device which is compatible with identification transponders carried by military aircraft. This will enable both civil and military aircraft transponders to be interrogated by both civil and military ground radar.

Because of these Common System specifications, ANDB and AEEEC must force the civil transponder characteristics to the basic military system. Present problems are one indication that the military system itself has not yet been fully debugged.

The fact that both civil and military transponders can be interrogated, and must speak to both civil and military radars, is one of the causes of the present difficulties. In a suggested terminal area such as New York there will be numerous ground radar interrogating each aircraft's transponder.

When a transponder reply to one radar is received by another, these systems replies (called "blat") produce a clutter on the ground radar scope which can be as disturbing as a cluttering in that produced in heavy precipitation.

Another serious problem is that too many interrogations from a number of ground radars can overload the airborne transponder as that it is unable to reply to most ground interrogations.

'Do Feeder'

That such problems would exist has been known for some time. These and other beacon system problems, and possible solutions, were discussed by AEEEC's S. H. Reynolds at last fall's meeting of the Radio Technical Committee on Aeronautics.

For example, a "deleter" which allows not unacknowledged transponder replies (interfered for other replies) has

been developed and tested by the Civil Aeronautics Administration's Technical Development Evaluation Center. The test reportedly performed very effectively at TDEC, and also showed high degree of reliability.

The problem of preventing over-interrogation of airborne transponders is not solved to nearly. Because every airborne transponder reply, causing of a series of pulses, represents a finite time for transmission, there is a maximum number of interrogations which each transponder can accept and still have time to respond.

If the number of ground radar interrogations exceeds this, it is physically impossible for the plane's transponder to reply to each one. Such a situation might easily exist in an area such as New York or Boston.

Possible Solution

Walter Pike, ANDB's expert on radar location, summed up the problem and its possible solutions this way: "It is a matter of technical location in the system which we have to make to be operational control."

Talbot also indicated that the solution would have to be one of operational control, rather than a technical change in the system.

Although neither Talbot nor Pike revealed the facts that such operations control might take, qualified observers point out that it might involve reducing the interrogation rates of ground radars and/or making out an arrangement whereby each transponder is to be interrogated automatically as a means of saving time.

ANDB's Reynolds estimated that it would probably require 16 years to develop and implement another Common System, even because of the present one proved basically unsound and he said airborne operational centers could stand such a delay.

Further, and this is a point which Reynolds also made, the airborne transponder had been inherently designed to provide essentially full capability to that interrogation and reply system, as well as certain other characteristics, could be easily changed. Pike said: "Why not go ahead?"

Talbot agreed that ANDB's AEEEC should go ahead and line up its transponder characteristics, emphasizing that the new system must meet up with the purposes of the program. But Talbot qualified his recommendation this way: "If we can work out the problems—we'll

have a big gain. If we can't, we may have to accept a big degradation of service."

Emphasizing the importance of a better system, Talbot noted that the new jet lines will start down up to well on ground radar, even in good weather, particularly when viewed by the radar from a head-on position.

Propellers, which are excellent reflectors of radar energy, make precipitation, snow, fog, haze, better radar targets than jets.

CAN's implementation of a three-ground station beacon evaluation set-up in the New York area will be delayed until at least January 1977, as until June of 1977 if CAN decides to install "deleters." Pike estimated.

Although Talbot did not see, otherwise report that ANDB expects to have by this spring whether the present beacon system problems can be easily solved, and need not await operation of CAN's New York set-up.

Observers speculate that the solution hinges on certain high-level military policy decisions, which Talbot was not free to reveal because of secrecy.

Although ANDB's warning has made transponder manufacturers somewhat more cautious, it probably will not slow down the availability of airborne equipment, providing that the problem is resolved within the next few months.

Wilco's Electronic, which will mass-produce and market a transponder developed by Meteor, plans to start looking up for production in April and expects to be turning out transponders by June, a company official told Airman's Week.

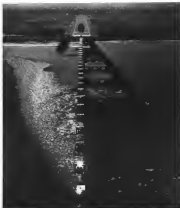
Boeing Radio and Collins Radio both plan to produce their transponder equipment developments without any slow down, company spokesmen indicated. However, Collins says that its manufacturing plans "may have to be reconsidered in view of the possible effect on airline plans to install transponders."

BOAC Bid for New Routes Approved by Examiner

New routes to the West Coast, the Midwest and the Brazil, West Indies to British Overseas Airways Corp. have been recommended by Civil Aviation Board Examiner Carlo G. Henderson.

Henderson would allow BOAC to add Detroit as a seasonal point in the United States and to operate between London and San Francisco. He also gave BOAC a route to the West Coast, New York and Miami B. W. I.

The British carrier has applied for the new routes since the signing of the air services agreement signed between the U.S. and the United Kingdom at Bermuda in 1956.



FIRST TWO LAMPS of approachlight system begin flash signal as plane approaches.

New Idlewild Approach System Designed to Ease Landing Hazard

By George L. Christian

New York—The installation of a top-producing, high accuracy approach light system designed to reduce the landing hazard on bad-weather landings has been completed at New York International Airport.

Basically, the entire U.S. National Standard Configuration. A repetition on the principle of the British, engineered lighting lamps visible in almost any weather but with a flash duration short enough not to blind the approaching pilot.

The 3,000-ft long approach light system, 2,500 ft of which is contained on a pilot extending from the south end of East River Runway Number Four (see picture above), was installed at Idlewild under a Civil Aeronautics Administration contract and consisted of 30 variable beam speed 180 ft apart.

The bars are 14 ft wide (except for the 4200-lb illuminated of the field

bar and the 100 ft long distance bar) (see photo). The approach light system is designed except for the entrance of threshold and two-way bars (shown as red lights) and the runway threshold bar light (shown). The bar lights give a pulse rate of 100 per second.

Quiet Tracer Shows

The principal feature of the new lighting system is the incorporation of new Shobson (highly sensitive) flashing beacon light in the center of each of the first 20 center bars. Called EFAS (Electronic Flash Approach System), each of the 30-lamp configuration system is fired twice a second in sequence to reveal the runway. Pilots on approach receive the impression of quiet tracer shells being fired towards the end of the instrument runway at a speed approaching 2,700 mph.

Pilots are not blinded by the flashes since the very short flash duration—



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about 17,000 sq-in—does not permit rotation by the human eye.

The extreme intensity of the Mirel has caustic power lamps manufactured by Sylvacon Electric Products pushes the flickers through had weather conditions that would obscure other light sources.

Capt. John Gill, chief pilot of Eastern Air Lines and a long time advocate of Stroboscopes, tested these three elements controlled by a secondary remote approach and provided by the same light.

• **Identification.** The behind lights fading towards the runway through fog, fog or snow, instantly identify the lights as an approach light; they could not be mistaken for any other type of illumination.

This is how the Stroboscopes light looked to Captain Gill while making an approach through heavy fog. "The first flash resembled a white-hot football swinging away in front of the plane. In a very short space of time, the other flashes became visible."

• **Direction.** Because of the frequent fading, a pilot can immediately orient himself and determine the runway's direction.

Captain Gill said Stroboscopes' directional features also eliminate the uncertainty problem of observation that usually befalls a pilot when he first breaks out beneath an overcast.

• **Time-lapse.** Invention from unexpected to conflict flying is greatly simplified because the Stroboscopes are visible five to nine seconds before the horizontal bar lights come into view (in-

tercity of the bar lights can be signposted by the horizontal bar). The lights establish solid guidance and allow the pilot to complete his transition from instruments to visual approach.

Electrical & Mechanical Details

The heart of the Stroboscope is a vacuum-filled lamp placed across a 30-microsecond condenser. Application of an instantaneous, high-voltage trigger pulse causes the condenser to discharge, producing a bright white light. The lamp costs approximately \$35 and has an average operating life of about 180 hr.

Sylvacon made a conscious effort to keep all electrical circuits and components as simple as possible, and the coils are standard automotive type.

The lamp is housed in a waterproof, corrosion-resistant aluminum housing. The front lens is of tempered glass to

prevent breakage. The rear cover is easily removed with a screwdriver.

The lamp chain has wheels on the front end so that it can be easily rolled out of the cabinet for maintenance and repair.

A special device allows the lamp to be locked in the event that the support is not level. Provision is also made for the adjusting of the lamp's elevation.

All components are made to meet Army and Navy specifications.

Total Cost

Total cost of the Mirel installation (equipment only) was about \$18,000.

The Mirel installation is an improvement on a similar Sylvacon system which has been operating at Newark Airport for the last ten years and has been used highly by airline pilots.

Experts See More Airline Gains, Hear Attack on Defense Transport

By Craig Lewis

Washington—Predictions of continued gains in airline business have been made to an annual transportation meeting of the U. S. Chamber of Commerce, which also featured a House Commerce official's attack on Defense Department transportation policies.

Defense has urged a report warning the House Commerce subcommittee. It urges that certain military transportation services should be strengthened, but objects to efforts to control the Military Air Transport Service and the use of administrative support.

The views on the future of transportation were heard at the 1961 National Transportation Council, Conference held here under the chairmanship of J. H. Charnick, president of Capitol Airlines.

Economist Paul W. McCracken told the group that the outlook for the nation's economy is good and the current boom will continue through this year if government expenditures, capital outlay and consumer spending continue to make expected gains.

Passenger Increase

A financial expert told the meeting the airline industry is enjoying an extraordinary growth. The country is becoming more air-minded, and passenger traffic can be expected to increase more than 12% this year, according to F. J. J. Jones, transportation specialist of Merrill Lynch, Pierce, Fenner and Smith.

Jones pointed out that recognition of the economic soundness of air transportation has been confirmed by large

money lending organizations which have made substantial loans and credit provisions to airlines seeking to finance new equipment programs (AW Jan 9, p. 96).

Inventor confidence in advancing developments in airline growth and earnings programs are better appreciated, he said. He said strong financial positions and the prospect of higher earnings from heavy capital investment now planned suggest much more better development of future airlines.

A review of House Commerce proposals to improve Defense Department transportation policies and procedures was made by F. M. Stenhouse, chairman of the House committee which made the study.

MATS Criticism

Stenhouse said that MATS and other military air services are developing more serious of the economical strains and that operations of the military services are overlapping and inefficient.

The House committee found that the Navy is operating an airline, Fleet Logistics Air Wing, in competition with MATS, using one fourth as many four engine aircraft as MATS. Stenhouse said that the Navy is better equipped by the Navy's Douglas A-1H shuttle operation, the Air Force Logistics operation and the extensive use of administrative assets by the various air commands.

All these competing services should be combined under MATS, according to the House study. The House Commerce also finds that MATS should



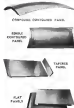
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refine its operations to essential traffic and stop carrying passengers and cargo which could be reasonably handled by commercial airlines.

The Defense Department agrees in its report that cutting military air services should be merged into one operation. It plans to do this and to put the whole operation as an industrial fund here in order to allocate costs among the military departments using the service.

Airlift Capacity

But Defense disagrees that MATS activities should be restricted to absolutely essential traffic. The department agrees that in order to develop and maintain an adequate and efficient wartime airlift it must keep a large peacetime establishment in readiness. And as long as this large airlift capacity exists, it should be used, Defense agrees.

The Defense report acknowledges the need for strengthening and expanding the civil air transportation industry but it feels that diversion of traffic from military services is an artificial basis for expansion and would increase the overall Federal cost of providing for a self-defense no doubt.

The only way to develop the air transport capability needed for war, Defense believes, is to increase peacetime use of air transport as a normal means of transportation. Right now, airlift capacity is used for emergency or other high priority use, and is not generally used to take advantage of potential over all logistics savings.

Defense studies now being conducted will point to the advantages of a logistics system based on the use of air transport as a normal means of transportation. Defense plans to use civil airlines to a larger degree in its logistics system as a means of expanding air transport on a sound financial basis without changing the mobilization readiness of the military air transport system.

The department says it will issue the maximum feasible use of civil airlines and will keep peacetime operations of military air transport services to the minimum level against the mobilization readiness and to meet requirements the civil airlines can't handle.

Administrative Frictions

A strong objection is reported against Hoover Commission recommendations that the number of military administrative units be cut drastically. Such a move is not in line with flight proficiency be used personnel assigned to administrative jobs Defense said. That be carried on then is considered and was space that would otherwise be empty, according to Defense.

Defense once again agrees with the Hoover Commission finding that a

Director of Transportation should be established to handle all its traffic and transportation activities. The report said that a study consideration which would streamline traffic management agencies and enhance the authority of the Director of Transportation and Communications at the policy level.

In a directive issued after the department recommended on the Hoover Commission recommendations, Defense defined its policies for utilization of military facilities and personnel of transportation from commercial centers.

The directive says that the department's economic interests won't be used "in such a manner as will adversely affect the general well-being of the

commercial transportation industry. Under the policy stated in the directive, the department promises not to force any mode of transportation in government of transportation in government transport will be used when it is available and capable of meeting military requirements.

Transportation of administrative personnel is called for to insure positive use of each form of transportation in a way that will recognize its inherent advantages. Considerations in such cases will include the utilization of the positive line of air personnel being moved and conservation of stocks through reduction of pipeline and storage requirements.

Monroney's Bill to Establish CAA As Separate Agency Gains Support

Washington—Sen. Mike Monroney (D-Calif.) has drawn more support on his proposal to divorce the Civil Aeronautics Administration from the Department of Commerce.

Two civil aviation associations and the AFL-CIO union group have endorsed the Monroney-sponsored legislation.

All three groups—Aircraft Owners and Pilot Assn., National Assn. of State Airlift Officials and the combined labor union, are critical of the Commerce Department's "domination" of civil aviation policies.

Senators called AFPA and seven unions representing airline and airport employees who attended the Eisenhower Administration's center of Fred B. Lee at CAA administration.

They were the first outside witnesses to testify before Sen. Monroney's Commerce Aviation Subcommittee, which is investigating Lee's firing last Dec. 10, and considering the bill to return CAA to the status of an independent agency.

The subcommittee's hearings may resume this week, after a week's recess scheduled by Sen. Monroney's preoccupation with a bill on school desegregation.

The testimony was taken last at headed by Louis S. Rothchild, Commerce Under Secretary for Transportation, whose appointment became the most far-reaching in the hearings opened Jan. 4. Also the Air Transport Assn. is prepared to face the subcommittee with a staff of experts on air traffic control operations.

J. B. Hartman, president of AFPA, and Monroney, the CAA administrator, are being "bounced" in and out of office like tennis balls. He described the rapid replacement of CAA chiefs in recent years as a "bizarre spectacle of mutual chase" which he said has inhibited the growth of aviation. AFPA has a membership of about

16,000 active pilots, Hartman said.

As president of AFPA, Hartman said he favored a divorce of CAA from Commerce "in essential to afford the administrative a clean and unimpeded channel for creating and implementing fundamental aviation policies."

He pointed to the last three administrators as having served an average of only 21 months and declared "no businessmen would tolerate a turnover of his key personnel like that." But the Commerce Department, he said, has made a reputation from being out of the administrator's office.

Hartman called Lee one of the few competent, well-qualified administrators the CAA has ever had. He stated that "another Lee would undoubtedly call for the CAA operation by distributing jobs security, the leadership of technicians who perform services vital to the public safety."

A. B. McVittie, executive secretary at NAAAD, said he didn't know of any business who would tolerate a turnover from Commerce Department administrators, particularly in companies with such staff have been accomplished if CAA has been operating in its independent agency.

He added that NAAAD has reluctantly come to the conclusion that "and aviation has been given more and more responsibility of the White House and has in effect a real status since CAA was put in the Commerce Department."

McVittie said that of 16 state commissions which are operated by the states, all but three have been taken over by CAA.

Another witness, George D. Riley, legislative representative of the AFL-CIO, and the aviation industry unions were unanimous in their approval of the Monroney bill.

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The jet age is arriving for passenger travel with the new Boeing 707 and Douglas DC-8 jet transports. Leading U. S. and foreign airlines have recently announced orders for large quantities of the new transports, and still more orders are in prospect.

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Sncase Starts International Drive To Sell Caravelle Jet Transports

New York—A world-wide sales and service organization is being established by Sncase to promote its Snc-210 Caravelle turbojet aircraft. George Herli, president and director general of the French company, is visiting U.S. airports to support and sell the prototype of the aircraft's engine transport.

The Snc-210, of which 12 have been ordered by Air France, will be powered by two Rolls-Royce Avon RA25 engines, now delivering 10,500 lb static thrust each. Rolls-Royce has promised that the RA25 will soon produce 11,000 lb thrust.

Each model will have a range of 1,500 mi with full payload of 16,000 lb and fuel reserve of 2,000 lb. Maximum gross takeoff weight is 90,000 lb. Normal seating arrangements are for 79 passengers; the aircraft that a high-density version is possible with seats for 94 people. Cruising speed will be 450 mph.

The Snc-210, which Sncase expects to power with Rolls-Royce Conway engines, will gross 165,000 lb at takeoff. With a 16,000 lb payload, its range will be increased to 2,500 mi with normal fuel reserve.

Seat-While Costs

Using standard Air Transport Association formulas, Sncase claims these low estimates for the Caravelle:

- One aircraft will provide 70 million seat/mile miles per year, based on a 400-mile range of 400 mi.
- Fourteen Caravelles, representing an investment of \$12 million, will provide one billion seat/mile miles per year.
- A Snc-210 will carry 74 tons on a 300-mile range, at a cost of 1.5 cents per ton-mile. In 1.5 years, for a 1,200 mi stage and 17 tons for a 1,500 mi stage.

Sncase is first flight by May 27; the prototype had made 101 flights, totaling 222 hr.

The company claims that 90% of the technical tests, including the new tests are completed. Testing of the engine and engine equipment is about to begin.

A second prototype is scheduled to begin flight in April.

At maximum gross weight of 90,400 lb, the prototype takes off and climbs 22 ft. obstacle in 4,000 ft. With one engine cut out at the critical point of the takeoff run, it clears an obstacle at 5,750 ft.

Sncase further claims that from a standing start on a single engine, the Caravelle climbing 66,000 lb clears a 56 ft. obstacle in 6,100 ft.

Leading distance over a 50 ft. obstacle is 5,400 ft.

The prototype will be delivered to Air France this summer for evaluation tests. Operations on Air France's European and North African routes will begin early in 1959.

Production Plans

Noting the extensive experience of Vickers in manufacturing the production requirements for the Viscount, Sncase has arranged to expand Caravelle production at a second plant in... It will build only 50% of the airframe and components, subcontracting the remainder to Sncase and Sncase. They intend to build aircraft per month.

Further arrangements have been made for production by other European aircraft manufacturers, including Fokker at Maastricht, Fiat at Turin and Gnome at Lyons.

Sncase also has indicated that Republic Aircraft Corp., as reported, will manufacture the Caravelle in this country, under major USAF orders received. It expects Republic to construct an existing Sncase's technical standards and experience. Sncase makes space for Republic's F-44 jet fighter, and in providing major sales insurance for these Caravelles sold to American operators.

Minor Changes Made In Southwest Case

Washington—The Civil Aeronautics Board made only minor changes in its Southwest Airlines case decision when it dealt with petition for reconsideration.

The term change was a modification in a long-held restriction on Texas World Airlines' new service at Tulsa and Oklahoma City. In place of long, short-haul routes from Tulsa to the two points to Albuquerque, Wichita, El Paso and Kansas City, Mo., the CAB decided today to prohibit TWA from serving Tulsa or Oklahoma City on flights which serve Wichita, Tulsa or Kansas City.

Other minor modifications were made in the newly to American Airlines, Capital Airlines and Delta Air Lines.

Major objections to the CAB decision had been made by Eastern Airlines in its petition for reconsideration. Eastern asked the Board to give solid service between Dallas-Ft. Worth and other points on the airline's system. The CAB and Eastern presented

very little new material in its proposal, and the new material was so largely to Eastern's previous case that further hearings would be required before an appeal could be made. The Board found that reopening of the case is unwarranted.

The petition of Ft. Worth to reopen the record was also rejected. The CAB decided that both Dallas and Ft. Worth were named in separate petitions without restriction, and the only purpose of reopening the case would be to restrict or deny service to Dallas to the advantage of Ft. Worth.

CAB Orders

(See 540)

GRANTED

Granted Airlines on exception to treat Ft. Worth, Mo., as an intermediate point between Tulsa and Ft. Worth, Okla., on its line.

Granted Airlines on exception from terms of an order which requires Ft. Worth, Okla., to be served through Tulsa, Okla., by the airline.

American Airlines petition to serve Houston through the Houston International Airport and Pittsburgh through the Center City Airport.

APPROVED

Agreements between Pan American World Airways, Eastern and Western Airlines and various other airlines on inter-airline agreements.

ORDERED

Suppression and investigation of a Texas World Airlines petition to provide long-haul transportation and special baggage allowances.

Capital Airlines' petition to provide service from Tulsa to Albuquerque, Ft. Worth, El Paso and Kansas City, Mo.

United Air Lines' petition for the Houston route out of the gate provided by the Board in its order made in the period May 1, 1947 to Aug. 6, 1951.

DISMISSED

North Central Airlines' complaint against the ruling by Robert R. Stewart to director and officer of Lake Central Airlines, under the Board rules that the charges of fraud, which would allow against Stewart.

DENIED

Petition of the Town of Silver City, the Silver City Civil County Chamber of Commerce and the Town of Clifton Missouri for reconsideration of the Board's decision. The petition of the City of Silver City and the Silver County Chamber of Commerce for permission to intervene in the case is denied.



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Airline Traffic—November 1955

	Total Revenue Passenger Miles	Revenue Passenger Miles (000)	Load Factor	U. S. Mail Ton-Miles	Express Ton-Miles	Freight Ton-Miles	Total Revenue Ton-Miles	Per Cent Revenue to Available Ton-Miles
DOMESTIC								
American	591,438	333,128	87.04	1,466,893	969,872	6,553,465	61,338,213	62.04
Boeing	133,543	49,167	58.39	149,688	185,959	575,212	3,250,328	32.47
Continental	105,763	62,348	59.04	235,291	250,415	346,568	5,817,233	44.48
Colonial	25,312	52,840	43.36	13,542	8,361	358,819	46,775	46.77
Continental	45,211	19,598	50.79	64,267	85,618	170,162	1,961,589	44.08
Delta	768,804	79,180	60.35	867,446	909,076	938,683	6,566,860	36.92
Eastern	509,904	951,958	57.65	448,542	575,535	1,130,817	19,850,501	42.11
Northwest	315,537	978,095	60.64	3,895,190	865,472	386,215	6,597,441	67.45
Northwest	35,258	2,160	56.35	5,943	15,473	58,540	358,505	33.74
Northwest	85,015	54,310	59.79	351,444	345,891	813,600	1,566,391	49.08
Trans World	315,537	978,095	60.64	3,895,190	865,472	386,215	6,597,441	67.45
United	426,189	284,083	59.45	8,054,900	1,150,141	3,544,858	37,396,507	52.55
Western	87,170	39,636	53.83	227,787	83,450	274,765	4,396,204	51.80
INTERNATIONAL								
American	9,883	6,653	69.74	17,611	386	218,305	536,405	64.65
Boeing	9,883	4,959	50.18	30,401	—	75,315	877,529	54.67
Continental	70,581	777	1.10	963	—	18,718	46,617	46.67
Colonial	1,468	1,506	43.95	524	—	7,734	135,625	49.13
Delta	3,016	4,214	41.66	7,963	—	68,767	490,362	36.49
Eastern	13,183	18,793	55.40	65,768	—	33,735	5,116,011	47.82
National	7,397	4,501	56.66	4,503	3,435	43,916	468,600	47.96
Northwest	6,183	18,816	40.87	1,014,104	15,843	667,099	3,235,345	60.33
Trans World	5,899	10,767	46.17	33,719	—	235,087	1,345,048	53.51
United	54,307	18,445	34.21	830,025	—	1,949,899	10,500,180	59.23
Western	14,088	58,265	63.50	1,007,716	—	1,307,735	7,965,252	64.47
Latin America	76,450	46,754	33.79	304,776	—	3,308,165	16,419,941	57.98
Europe	10,917	18,558	75.36	64,813	—	897,269	2,497,381	37.56
Trans World	14,088	37,663	12.23	747,628	—	799,768	5,189,885	63.08
United	5,912	15,032	29.76	97,845	—	34,978	1,430,415	50.86
LOCAL SERVICE								
Airline	35,899	4,307	45.78	6,704	17,693	—	495,070	44.60
Boeing	9,285	7,014	27.50	3,318	8,745	—	800,892	66.81
Continental	2,361	3,210	58.19	1,482	1,675	—	131,234	32.49
Frontier	18,619	3,109	39.27	13,955	6,564	—	371,238	48.63
Lehigh Valley	3,205	1,460	34.78	1,410	14,680	—	154,626	34.25
Norfolk	86,387	1,851	49.17	4,718	5,295	—	485,544	34.55
North Central	33,449	4,630	43.25	13,891	89,879	—	375,441	18.65
Omaha	22,039	3,398	34.83	7,009	17,642	—	336,039	35.46
Piedmont	99,754	5,537	49.47	15,347	10,555	—	576,219	49.16
Southwest	13,008	2,776	40.68	7,963	18,244	—	246,751	18.68
Southwest	79,953	4,299	51.23	12,811	4,289	—	420,804	31.38
Trans World	13,116	2,564	26.18	12,485	6,094	—	313,568	36.16
West Coast	14,036	5,455	37.57	3,452	2,638	—	236,568	44.98
HAWAIIAN								
Boeing	57,634	3,214	54.35	3,719	—	719,380	416,013	48.63
Trans World	16,406	1,537	44.35	949	—	5,068	127,448	44.04
CARGO LINES								
American	—	—	—	—	—	608,012	558,516	61.37
Boeing	—	—	—	—	—	8,006,464	3,810,351	72.77
Continental	3,428	14,308	12.90	—	—	3,804,530	5,656,795	75.13
Delta	9,013	3,813	74.00	89,979	—	1,833,717	1,374,717	91.31
Eastern	—	—	—	—	—	—	—	—
Northwest	—	—	—	—	—	—	—	—
Trans World	—	—	—	—	—	—	—	—
United	—	—	—	—	—	—	—	—
Western	—	—	—	—	—	—	—	—
HELICOPTER								
New York Airways	3,314	47	35.47	943	1,301	—	3,168	54.29
Los Angeles Airways	575	21	35.80	4,060	1,592	—	7,560	27.46
Manhattan Air Service	—	—	—	—	—	—	4,930	39.16

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Rizley Urges CAB Regulation Of International Carrier Rates

Washington — Civil Aeronautics Board sought authority to regulate rates of international air carriers in opening testimony at hearings before a House Commerce Subcommittee on civil aviation policy.

Congress has repeatedly turned down CAB requests for the same rate regulation authority, over international concern that it less our domestic carriers.

Emphasizing that the economy for the additional authority is increasing, CAB Chairman Ross Rizley told the subcommittee that this was pointed up last year by "the confessional bidding which dominated for foreign military (fighter) services because of the strong unit competition, he said. "The situation is such as to give rise to reasonable fear that unless the maximum rates of these carriers are regulated and fixed by the board, the safety of these systems will be jeopardized."

CAB Seeks Speed

Other developments at the hearings of the subcommittee, headed by Rep. Otis Harris (D-MN), were:

- **Air Transport Asia's** new president, Stuart Tipton, called for legislation requiring all airlines and contract carriers to obtain certificates similar to scheduled carriers. He denounced CAB's recent decision authorizing a number to operate 10 round-trip flights between two points at beginning, middle, and ending the month, free to come over the U.S. operating between any points they choose.

- Recommendations to provide for a speed up of proceedings are now being drafted by CAB for submission to Congress.

- **CAB is considering a "clump down" on "bids."** Rizley suggested culling in the Federal Bureau of Investigation as before incidents and the possibility of amendments to Civil Service law providing for the removal of employees. Personnel information Rizley objected, given the view for international parties to bring heavy pressure on the board before final action is taken.

In international commercial operations, Rizley told the subcommittee, "It is not true that the airlines exist a legitimate to cut rates below economic levels in order to do so, to explore a large share of the market, with the hope that the losses of one, would be recovered by the others."

"But now that a number of major routes are for the first time being operated without subsidy, there is a

real danger that the trend will shift in the opposite direction. Some carriers increase to a substantial extent, there will be an increasing temptation to increase rates in a point which will increase the carrier's income, though this may well be above levels that would be considered reasonable."

Tipton's Views

Rizley predicted elimination of CAB's authority to provide new services by exception from the certificate requirement, as proposed by Tipton. Rizley said that certificate procedures should be used in instances where the new services proposed are of the same type and subject to these already in operation and, in effect, merely purport to duplicate these services.

Tipton vigorously denounced that as nonsense, "that anyone who can think up anything at all new to do" would be authorized to operate an air transport service without having to obtain a certificate.

With no decision in the Large Is regular Case, Tipton said "The Board seems to have abandoned all efforts to bring the needed current into the certificate system. On the contrary, it has given them a pat on the back."

The large-scale operations of new carriers in the 1970 Civil Aeronautics Act "Tipton pointed out the set was intended to authorize only small scale operations, such as fixed-base operations without the certificate requirement."

Shortlines

- **Air Austria** has ordered four Vickers Viscount 580 aircraft for delivery late in 1977.

- **Boeing** has issued early regulations for Americans and Canadians as visitors can stay for 60 days without a visa. Visitors will need only a passport, vaccination certificate and enough plane ticket when the regulations become effective in March.

- **B. K. S. Air Transport Ltd.** will start a new service between Belfast and Edinburgh Apr. 25. The route will be operated with Viking aircraft.

- **Southern Airways** carried 13,500 passengers in December, a 36% increase over the previous December. The carrier flew 2,300,000 passenger-miles last month.

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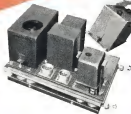
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